

ACRP

REPORT 68

Guidebook for Evaluating Terminal Renewal Versus Replacement Options

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ACRP REPORT 68

**Guidebook for Evaluating
Terminal Renewal Versus
Replacement Options**

RICONDO & ASSOCIATES, INC.
Chicago, Illinois

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Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), Airlines for America (A4A), and the Airport Consultants Council (ACC) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

The ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

Research problem statements for the ACRP are solicited periodically but may be submitted to the TRB by anyone at any time. It is the responsibility of the AOC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

Once selected, each ACRP project is assigned to an expert panel, appointed by the TRB. Panels include experienced practitioners and research specialists; heavy emphasis is placed on including airport professionals, the intended users of the research products. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, ACRP project panels serve voluntarily without compensation.

Primary emphasis is placed on disseminating ACRP results to the intended end-users of the research: airport operating agencies, service providers, and suppliers. The ACRP produces a series of research reports for use by airport operators, local agencies, the FAA, and other interested parties, and industry associations may arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by airport-industry practitioners.

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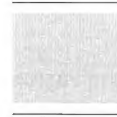
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FOREWORD

By **Theresia H. Schatz**

Staff Officer

Transportation Research Board

ACRP Report 68: Guidebook for Evaluating Terminal Renewal Versus Replacement Options provides a guidebook for airport professionals, policy makers, and industry professionals with a step-by-step process for conducting a business-driven evaluation of competing options to renew or replace airport terminal facilities. Some of the contributing factors of these decision-making tools include life-cycle cost, airside/landside or terminal capacity in relation to passenger demand, facilities obsolescence and condition, development risk, development schedule, changes in regulatory requirements, airline needs, operational constraints, tenant make-up, and airport business model. The process is repeatable and scalable to airports of different sizes. Furthermore, the guidebook is intended to assist airports in identifying the need for terminal redevelopment and selecting among competing options for renewing versus replacing existing terminal facilities. The guidebook promotes a sequential four-step process wherein the need for terminal redevelopment is determined, options are developed, evaluations are performed, and recommendations are documented.

Many airport terminal facilities (e.g., terminal buildings, parking garages, and terminal roadways) are nearing the end of their design lives and/or are becoming functionally obsolete. In addition, airline industry changes have reduced the need for demand-driven expansion. These changes, as well as the financial state of most airlines, put an additional financial burden on airport operators to maintain current rates and charges. Very often, components of terminal facilities reach the end of their useful life or become significantly outdated long before the structural integrity of the facility reaches the end of its useful life. However, these components, such as mechanical and information technology systems, can be very difficult and costly to replace without major impacts to the facility and disruption to ongoing operations. Further compounding the issue is the lack of space available at many airports to simply construct replacement facilities and avoid much of the complexity of renovating existing facilities without significant disruptions. Airports with adequate space face tough scrutiny from the airlines to provide significant justification that new facilities are a more financially feasible solution than renewing the current facilities.

Thorough analysis of the myriad relevant factors is required in order to decide whether to renew existing facilities or construct replacement facilities, particularly when the new facilities are not demand-driven. This detailed analysis is typically not included at the Master Plan level but should occur before facility programming and schematic design services are commissioned. Nor can this analysis be conducted by simply comparing the initial capital cost of multiple options, but rather must provide a total life-cycle cost outcome perspective. These issues can be further compounded by multiple, competing and conflicting interests of

the various stakeholders. Achieving consensus on the most effective solution can be difficult without a set of decision-making tools.

This report was developed from the research conducted for Project 07-07, "Evaluating Terminal Renewal versus Replacement Options" and includes a variety of airport interviews with representatives from U.S. airports who recently completed similar evaluations to decide whether to renew or replace their aging terminal facilities over the period of 2006 to 2011. A case study example referred to as City Airport is included as a terminal redevelopment case to facilitate user understanding of techniques to evaluate competing options. The City Airport example is intended to enhance user recognition of the general process, techniques, and specific tools used in the evaluation. More importantly, the City Airport example will facilitate user understanding of the sources of data needed to conduct an evaluation, synthesize separate analyses that may be undertaken by different groups involved in the evaluation, and interpret the analyses in terms of an airport's Strategic Plan or Master Plan.

Appendix A provides the definitions of the key terms used within the context of the Guidebook. Appendix B provides additional quantitative information related to the City Airport example application. Appendix C provides documentation for the Excel-based analysis templates that reflect the unique operating and business environment of a particular airport. The templates themselves can be found on the accompanying CD (CRP-CD-112). Appendix D provides references to additional literature related to the concepts discussed in the Guidebook. A separate report, which provides background to the research conducted in support of the Guidebook, has been posted on the ACRP Project 07-07 web page at <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2807>.



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Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

PART 1

Introduction to, Need for, and Organization of the Guidebook

Introduction

This report for Airport Cooperative Research Program (ACRP) Project 07-07: “Evaluating Terminal Renewal Versus Replacement Options” (published as *ACRP Report 68: Guidebook for Evaluating Terminal Renewal Versus Replacement Options*, hereafter referred to as the Guidebook) directs the user through a step-by-step process for conducting a business-driven evaluation of competing options to renew or replace airport terminal facilities. The process is repeatable and scalable to airports of different sizes. The Guidebook is intended to assist its users in identifying the need for terminal redevelopment and selecting among competing options for renewing versus replacing existing terminal facilities. The Guidebook provides information, tools, and techniques that can be used by airport professionals, policy makers, and industry professionals to develop and understand the processes needed to make fully informed decisions and to clearly state assumptions and conclusions required for facilitating stakeholder, government agency, and public project and funding approvals.

This Guidebook is based on the knowledge, expertise, opinions, and recommendations of airport executives and airport industry professionals. It is also based on information the researchers acquired through literature reviews, interviews, and analyses. The Guidebook sets forth and relies upon proven techniques and tools currently being used by airport operators, as well as practices used in other industries with significant facility asset management requirements.

Purpose of and Need for the Guidebook

Passage of the Airline Deregulation Act of 1978 began a period of rapid growth and expansion for U.S. airlines that lasted through the 1990s; however, since 2000, the effects of expansion, competition, increasing fuel prices, and global economic downturns have placed severe financial constraints on these airlines. The airlines have responded by reducing capacity nationwide and, in some cases, consolidating. Even as airport operators were adjusting to airline service reductions, the September 11, 2001, terrorist attacks caused unprecedented federal oversight and administration of air transportation security that dramatically transformed the way airport terminals function. As a result, aging terminal facilities—some already nearing the end of their service lives—are more rapidly approaching functional obsolescence.

As airlines reduce costs in an attempt to return to long-term profitability, airport operator initiatives to renew or replace aging terminal facilities frequently encounter resistance from the airlines. Purely demand-driven terminal replacement projects have become rare; instead, airport operators are just as often required to find ways to reuse terminal areas that have been “given back” by the airlines. Airports with underutilized space are facing scrutiny from the airlines to justify the replacement of aging facilities as being more cost effective than facility renewal.

Airport operators are challenged to develop alternatives to evaluating strictly cost-driven approaches for renewing or replacing terminal facilities. While it may be easier to reach consensus using strictly cost-driven approaches to decision-making, such approaches may not provide airport operators the ability to implement long-range strategies that would improve the competitiveness of their airports.

The purpose of this research project is to formulate guidelines for conducting a business-driven evaluation of competing options to renew or replace terminal facilities that is repeatable and scalable to airports of varying sizes.

Organization of the Guidebook

This Guidebook initially presents a general discussion of terminal building life-cycles, motivations for, and factors that affect, terminal redevelopment at U.S. airports as well as the roles and responsibilities of persons and organizations undertaking major terminal redevelopment programs. Understanding the context in which terminal redevelopment takes place is critical to formulating an evaluation process that will provide decision makers with business-driven analyses and recommendations to align a terminal capital program with the airport operator's strategic goals for the airport. Appendix A provides the definitions of key terms used within the context of the Guidebook.

The Guidebook describes a preferred, sequential four-step process wherein objectives and needs are established, options are developed, evaluations are conducted, and recommendations are documented. Specifically, the four steps are as follows:

- Step 1: Determine Need For Terminal Redevelopment
- Step 2: Refine Terminal Redevelopment Objectives and Generate Options
- Step 3: Evaluate Options
- Step 4: Document Results From the Analyses

The evaluation of options for terminal renewal versus terminal replacement is, in reality, only one phase of a larger process for planning terminal redevelopment. Therefore, the Guidebook references available literature that will assist the user in developing prerequisite information to prepare for the actual evaluation of competing options, which primarily occurs under Step 3. In the Guidebook, a case study example terminal redevelopment case referred to as City Airport is used to facilitate user understanding of techniques to evaluate competing options. The City Airport example is intended to enhance user recognition of the general processes, techniques, and specific tools used in the evaluation. More importantly, the City Airport example will facilitate user understanding of the sources of data needed to conduct an evaluation, synthesize separate analyses that may be undertaken by different groups involved in the evaluation, and interpret the analyses in terms of an airport's Strategic Plan or Master Plan. Appendix B provides additional quantitative information related to the City Airport example application.

Airport terminals are complex facilities that exhibit vastly different characteristics in terms of size, air service, business arrangements, governance, and physical condition, among other characteristics. Consequently, tools described in this Guidebook should not be considered formulaic. Users of the Guidebook will necessarily have to adapt the templates provided in Appendix C to reflect the unique operating and business environment of a particular airport. Even so, users will find the evaluation methodology described in the Guidebook to be fully adaptable and easy to integrate into their existing processes for developing unique terminal-related capital programs. For additional information related to the concepts discussed in the Guidebook, a literature review is provided in Appendix D.



PART 2

Conditions and Environment for Terminal Redevelopment

Common Motivations

Exhibit 4-1 illustrates the typical life cycle for an airport terminal building. The service life of the terminal begins after construction is completed, at which point operating conditions, levels of service, and reliability are at their highest levels, and routine maintenance is able to sustain “near original” terminal conditions. Over the course of the terminal’s service life, deterioration of the terminal’s condition naturally occurs with age and use, eventually requiring refurbishment or renewal of the terminal building to extend its service life. As importantly, since a terminal is designed to perform specific functions, the service life of a terminal is as much affected by its ability to perform those functions as by the condition of the building’s equipment, components, and systems. Consequently, the service life of a terminal facility can also be reduced by operational, technological, and regulatory changes that denigrate its functionality.

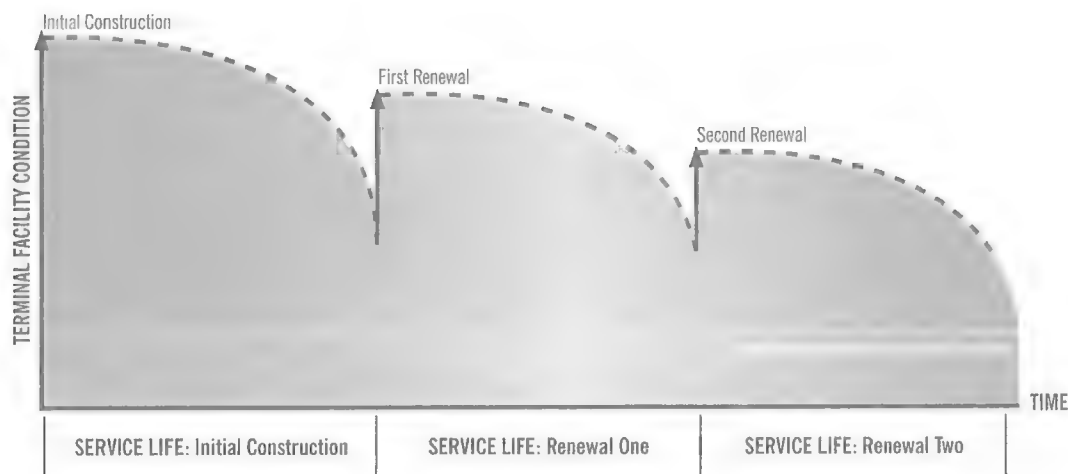
Many terminal buildings successfully undergo a series of renewal cycles during which building components and systems are refurbished, and even undergo significant changes to the original layout of interior spaces. However, depending on the initial design of the terminal and its age, subsequent terminal renewals may decrease levels of satisfaction even as the terminal’s service life is extended. Decreased satisfaction levels may result from compromises to budgets, expectations, and/or mission capabilities. Eventually, over the course of repeated renewal cycles, a competing alternative to replace an existing terminal will present better value in terms of benefits outweighing costs.

Table 4-1 lists common factors that motivate terminal redevelopment planning. The “location in process procedure” identifies the specific step within the four-step process in which the trigger would be applied or acted upon. Meanwhile, the “evaluation tool or procedure” identifies the method(s) that can be used to analyze the terminal condition related to the trigger.

Building Age and Physical Condition

The age and condition of a terminal are often cited individually as well as in conjunction with other functional deficiencies as factors that motivate terminal redevelopment planning. As buildings near the end of their service lives, in particular, buildings that have undergone previous renewals, each cycle of renewal returns less value in terms of long-term flexibility to accommodate constantly evolving airline initiatives, new technologies, security protocols, and customer expectations.

When undertaking terminal renewals, airport operators must accommodate local and national building code requirements, life safety standards, and Americans with Disabilities Act (ADA) requirements when the scope or extent of renewal plans require increased or full compliance with the latest codes and standards. In many cases, seismic, exit, fire suppression, and ADA

Exhibit 4-1**Terminal Building Life Cycle**

Sources: U.S. Department of Transportation, Office of Asset Management, *Life-Cycle Analysis Primer*, August 2002; Ricondo & Associates, Inc., June 2011.

Prepared by: Ricondo & Associates, Inc., June 2011.

requirements may result in significant costs for planned renewal actions. Table 4-2 associates the factors addressed by different national building, fire, and life safety codes in determining requirements to bring an existing facility into compliance with current codes.

Air Service Changes

Changes to an airport's air service, in terms of volume, market types, or fleet mix, may challenge the capabilities of a terminal. Examples of air service change scenarios that affect terminal capabilities include:

- Declining air service resulting in excess terminal space; alternatively, increasing air service creating demand for new terminal space that may challenge the capabilities of an existing terminal layout to efficiently expand.
- Market shifts, such as increased local boardings, which increase demand for landside terminal facilities; similarly, increased hub activity from an airline increases terminal apron and taxi-lane congestion.
- Introduction or increase in international service requiring U.S. Customs and Border Protection (CBP) facilities. International routes may also be served by larger aircraft and have longer ground times compared to domestic routes, and thus could increase demand for airport gates.
- The widespread use of regional (Airplane Design Group II) aircraft, which requires ground boarding facilities or specially adapted passenger boarding bridges; alternatively, greater aircraft wingspans, which improve aircraft fuel efficiency, reduce terminal apron and gate capacity.

Air service changes affecting an airport are typically beyond the control of the airport operator. They can be caused by an airline's national network plans, actions at competing airports, local agreements that affect the airport's operating hours, and even federal legislation in cases where an airport operates under a slot control or perimeter controls, such as the Wright Amendment

Table 4-1**Motivations for Terminal Redevelopment**

Trigger Category	Typical Triggers	Location in Process Procedure	Evaluation Tool or Procedure
Building Age and Physical Condition	<ul style="list-style-type: none"> Life cycle of building and systems past service life midpoint Regulatory changes in ADA, EPA, etc. Building code changes <ul style="list-style-type: none"> Code requirements triggered by new construction Building code changes (e.g., life safety, seismic) New or increased international flights 	Step 1	Prioritized Facility Condition Assessment; Facility Condition Index
Air Service Changes	<ul style="list-style-type: none"> Recent declines or increases in airport activity Changes in activity type (e.g., greater percentage of business or tourist activity) Significant change in connecting vs. O&D passengers Changes in passenger and aircraft service equipment and procedures <ul style="list-style-type: none"> Passenger and baggage check-in Passenger aircraft boarding and deboarding processes Increased demand for common use facilities Regional aircraft passenger loading bridge requirements Landside and airside concession locations Restroom sizing and locations Airline lounge requirements and locations Aircraft size and seating capacity changes Vertical circulation requirements 	Steps 1 and 2	Gap Analysis; Terminal Requirements; Concept Layout Planning
Functional Obsolescence	<ul style="list-style-type: none"> Changes in passenger and baggage security processing and equipment New concepts in concession services Airport and airline employee security control requirements Facility energy efficiency, 'green' and other LEED initiatives Declining or increasing activity levels by airlines leading to poor facility utilization Changes in activity resulting from airline code sharing and alliances Changes in activity by larger airlines resulting in relocations of smaller airlines Imbalance in terminal roadway and curbside demand Imbalance and congestion on taxiways resulting from aircraft gate capacity constraints 	Steps 1 and 2	Gap Analysis; Terminal Requirements; Concept Layout Planning
Optimizing Use of Multiple Terminal Buildings		Steps 1 and 2	Airport Activity Forecasts; Gap Analysis; Terminal Requirements; Concept Layout Planning

(continued on next page)

Table 4-1 continued

Trigger Category	Typical Triggers	Location in Process Procedure (Chapter 5)	Evaluation Tool or Procedure
Related Airport Development and Airport Master Plan	<ul style="list-style-type: none"> • Non-terminal airport development that affects the operation or site conditions of the terminals • Changes to airfield that constrain or expand terminal area site conditions • Changes to landside entrance and exit roadways or new automated people mover systems • Facility development adjacent to the terminal • Changes in passenger levels of service caused by changes in activity levels <ul style="list-style-type: none"> - Master Plan forecasts - FAA TAF - Local and regional socioeconomic growth projections • Civic aspirations caused by changes (usually decreases) in passenger levels of service • Civic aspirations related to terminal image and passenger services offered • Availability of additional funds from: <ul style="list-style-type: none"> - AIP entitlement and discretionary grants - PFCs - Other special purpose federal programs - State and local sources, including private sector • Changes in activity levels affecting ability to carry or sell debt • Terminal development initiated by airlines • Terminal development constrained by conditions and controls in Airline-Airport Use and Lease Agreements 	Step 1	Airport Master Plan, Capital Improvement Program
Passenger Activity Forecasts and Civic Aspirations		Step 1	Gap Analysis; Terminal Requirements
Availability of Funding		Steps 1, 2, and 3	Financial Capacity Analysis; Concept Planning; Financial Analysis of Options
Airline Agreements		Steps 1, 2, and 3	Gap Analysis; Terminal Requirements; Concept Layout Planning; Financial Analysis of Options

Notes: ADA = Americans with Disabilities Act
 AIP = Airport Improvement Program
 EPA = Environmental Protection Agency
 FAA = Federal Aviation Administration
 LEED = Leadership in Energy and Environmental Design
 O&D = Origin and destination
 PFC = Passenger facility charge
 TAF = FAA Terminal Area Forecast

Table 4-2**National Code Basis for Requiring Updated Compliance for Building Alterations**

Compliance Based on:	Code Standards			
	IBC	BOCA	NFPA	ADA
Building Area		x	x	x
Construction Cost	x	x		

Notes: ADA = Americans with Disabilities Act
 BOCA = Building Officials and Code Administrators International
 IBC = International Building Code
 NFPA = National Fire Protection Association

Source: Ricondo & Associates, Inc., June 2011.

Prepared by: Ricondo & Associates, Inc., June 2011.

limitations on Dallas Love Field or federal legislation controlling slot and perimeter rules that limit air service at Reagan Washington National Airport.

Often, an airline's initiative to develop air service at an airport triggers terminal redevelopment. In such cases, the airline becomes the principal advocate, oftentimes assuming management over the redevelopment process. The Dallas Love Field Modernization Program and the Terminals 3 and 4 redevelopment at John F. Kennedy International Airport in New York are examples of airline-led terminal redevelopment programs.

Functional Obsolescence

Since terminals are designed to perform specific functions, the service life of a terminal is as much affected by its ability to perform those functions as it is by the age and condition of the terminal's infrastructure. Functional obsolescence results from the normal evolution of airline operations in terms of new aircraft; the technology used for passenger transactions and to improve customer service; regulatory changes affecting safety, security, and the environment; and value-added services and concession programs intended to meet changing passenger demographics and expectations. A terminal's original design can constrain an airport's ability to respond to changes in how passengers and other users interface with the terminal, for example:

- Inability of the building's structural design in terms of column grids, floor-to-floor heights, and floor loads to adapt to changed terminal operational requirements
- Inability of a terminal floor plan in terms of building depth or number of building floors to adapt to changed or added terminal operational requirements

Certain areas of nearly every terminal have become particularly vulnerable to changes that have occurred within the past decade, including:

- The increased use of self-service terminal equipment in the ticket lobby, off-site check-in alternatives, and airline consolidation
- Pre-security concession areas
- Security screening checkpoints
- Baggage handling system areas and explosives detection system areas for screening checked baggage
- Facilities and equipment used to board aircraft
- U.S. CBP facilities

Optimal Use of Multiple Terminal Buildings

Air service and regulatory changes force airport operators to rebalance terminal interior spaces and find new uses for excess space. The operators of airports with multiple terminals are being challenged to consolidate operations into fewer terminal buildings in response to airline consolidations. These alternatives often result in the consideration to mothball older terminal facilities, but capital investments in remaining terminals are still required.

Related Airport Development and Airport Master Plan

Other development projects included in an airport's Master Plan or Capital Improvement Program (CIP) or tenant project requests can trigger terminal redevelopment. The design and construction of landside automated people mover systems or improvements to a runway system are examples in which terminal redevelopment can be triggered by airport development adjacent to the terminal area. In such cases, the adjacent development may constrain future development opportunities for an existing terminal and, as a consequence, the airport operator may initiate a terminal redevelopment plan to restore compromised capabilities and capacity needed to support growth. In other cases, an adjacent development may cause terminal redevelopment to be expedited to enhance the terminal's interface with adjacent improvements and leverage benefits from investments made in the adjacent development (e.g., the integration of a terminal station for a landside automated people mover system).

Civic Aspirations

Civic aspirations can also trigger terminal redevelopment. If passenger level of service is declining because of terminal age or growth in activity, policy makers may be motivated to improve the general attractiveness of the terminal as a "front door" to the community and contribute to regional efforts to attract new businesses and tourism or to increase land values.

Availability of Funding

In most cases, and particularly for smaller airports, the availability of federal AIP entitlement or discretionary grants can reduce local costs to a level that allows the airport operator to initiate or reconsider deferred terminal redevelopment programs.

Airline Agreements

While airline agreements do not typically create facility needs, they most often become the legal vehicle for initiating redevelopment. In some instances, an airport operator's desire to equalize the rental rates charged to the airlines can accelerate plans to renew or redevelop terminal facilities.

Contributing Factors and Guiding Principles that Influence the Evaluation Process

Internal and external conditions that create the operating environment of an airport, which most often pertain to the airport's business and facility conditions, are contributing factors that influence terminal redevelopment planning in general and the evaluation of competing options, specifically. While contributing factors can be generally categorized, the importance of any factor depends on its specifics and stakeholder priorities.

Business Conditions

Governance

Governance pertains to the ownership, management, and funding structure of an airport. It also pertains to the levels of responsibility and approval authority within an airport operator's organization. Airports typically operate under the jurisdiction of a city, county, or state government, or as a semi-autonomous authority established by legislative mandate.

- Airports owned and operated within municipal, county, or state governments typically have a manager or director hired by and reporting to the first or second tier of the governmental entity, such as the mayor or commissioner of public works. Often an advisory board is appointed to monitor airport conditions and performance.
- Airports run by authorities typically report to a board appointed by a governing body (such as the mayor's or governor's office). In some cases, the board is elected. In almost all cases, the airport board is responsible for hiring key airport personnel and approving major operational changes, the annual CIP, and significant capital investments.
- An airport's organizational structure commonly divides staff responsibilities into discrete branches that have individual operating budgets and reporting structures. Branches may include Executive Staff, Properties and Finance, Operations, and Facilities.

Airlines and other key stakeholders can and should also have a place in the governance of an airport if their airport agreements grant review and approval rights for capital development. The form of governance influences the evaluation process in several ways, but principally structures the evaluation process as well as the contributions and roles of participants.

Reference

- *ACRP Report 36: Airport/Airline Agreements—Practices and Characteristics*, 2010, provides information and guidance on issues related to governance in project development.

Historical/Current Market Conditions

Market conditions are considered in the airport's aviation activity forecasts and can be affected by the economics of the community served by the airport (destination airport, international or

domestic markets) or the business strategy of the airlines serving the airport (hub operation, international or domestic markets). While nearly all communities view airports as contributing to economic growth and community improvement, communities experiencing strong economic expansion have different considerations than communities with a shrinking economic base.

Historical and current market conditions influence the evaluation process in terms of financial capability, level of risk, and operational requirements. An airport's market dictates its operational characteristics, for example, international (such as New York's John F. Kennedy International Airport), regional (such as Wichita Mid-Continent Airport) or hub (such as Phoenix Sky Harbor International Airport) operations.

Aviation Activity Forecasts

Historically, forecasts have provided the principal basis for determining the nature and timing of improvements to terminal facilities. Significant terminal improvement programs should be supported by recently prepared and approved activity forecasts. The Federal Aviation Administration (FAA) prepares its Terminal Area Forecast (TAF) annually for airports receiving FAA and contract airport traffic control tower services. Forecasts are also prepared periodically by airport operators as part of Master Plans or other planning updates, and for various financial analyses, such as those prepared in support of the issuance of revenue bonds. Evidence of and predictions for growth offer information on the nature of terminal facilities that will be needed at an airport, along with the airport's abilities to support investments in terminal facilities.

Under current economic conditions, many airports are confronted with declining, stagnant, or slow growth forecasts, which affect the timing of decisions to rehabilitate or replace terminal buildings approaching obsolescence.

References

- *ACRP Report 25: Airport Passenger Terminal Planning and Design: Vol. 1: Guidebook and Vol. 2: Spreadsheet Models and User's Guide*, 2010.
- *FAA Terminal Area Forecast Summary*, published annually.

Strategic Plan

Airports typically have a Master Plan, if not a formal Strategic Plan, that describes the airport operator's goals and objectives for the airport and defines a roadmap to provide the aviation services desired by the community, the airlines, and general aviation users.

The strategic vision and near-term goals and objectives adopted by an airport's governing body guide the organization of the airport's resources and development of the airport's capital infrastructure, including the terminal. The airport operator's vision should address the needs of all relevant stakeholders, from airlines to concessionaires, and would include/address the following issues: maintaining costs at a competitive level and ensuring that airside, terminal, and landside functions are operationally reliable, efficient, and easily navigated by passengers and aesthetically pleasing. The airport's Strategic Plan or Master Plan forms the basis for evaluating terminal redevelopment options using a business-driven approach.

Reference

- *ACRP Report 20: Strategic Planning in the Airport Industry*, 2009.

Financial Capacity

Financial capacity pertains to an airport operator's financial resources available to undertake future capital development. A financial capacity analysis is particularly critical during initial

planning stages as it contributes, from a financial standpoint, to defining the overall size and scope of a capital program. It also helps an airport operator achieve the appropriate balance among capital needs, financial performance, and airport user fees. When analyzing the financial capacity of an airport enterprise, the unique conditions of the airport must be considered (e.g., the overall market tolerance for higher airport rates and charges may be different from one airport to another). Generally, as the overall cost and scope of the development increases, more scrutiny over justifications should be expected from stakeholders (i.e., the project's operational benefits must justify the financial commitment to implement the project).

Identifying and understanding existing airport operator funding and financial commitments are a key first step in measuring the remaining financial resources available to fund prospective capital development.

Revenue Growth and Diversification

In today's challenging financial environment, airport operators are seeking opportunities to improve their revenue streams through non-aeronautical sources, such as: enhanced terminal concessions, automobile parking, compatible commercial or industrial on-airport development, and other non-traditional sources. With respect to terminal redevelopment, airport operators are increasing the value to customers from the traditional sources of non-aeronautical business units (retail, food and beverage, customer services, wireless/information technology, and advertising) by using new presentation concepts, diversifying brands, and target marketing.

Reliance primarily on airline or other aeronautical revenues can increase an airport operator's financial risk, especially during economic downturns when airlines can least afford increased airport rates and charges. This financial risk could be in the form of decreases in aeronautical activity or even losses of service to other airports offering more reasonable rates and charges. Many airport operators have internal goals to reduce their reliance on aeronautical revenue. In general, an airport operator with higher revenue diversification has more flexibility in approaching capital development, and may be viewed more favorably by the investment community when seeking to issue debt to fund capital development.

Reference

- *ACRP Synthesis 19, Airport Revenue Diversification*, 2010, provides additional guidance and inputs regarding the overall importance of revenue diversification.

Facility Conditions

Facility conditions refer to the physical state and capabilities of the terminal, including age, inventory of spaces, level of service, operational functionality, space utilization, and revenue generation. Airlines have significant interest in the condition of terminal facilities as it affects profitability and the perceived service offered to its customers. Airport operators have significant interest in the condition of terminal facilities as it directly relates to their capability to provide good and uniform levels of service to passengers and other tenants. Facility conditions should also be considered in terms of the terminal's ability to accommodate changing technologies, operating requirements, and business strategies. The following subsections provide a more detailed discussion of aspects relating to facility conditions.

Inventory of Facility Conditions

Inventorying facility conditions pertains to the visual and operational conditions, age, and the currency of facilities, systems, and equipment at the airport. Currency refers to a comparison of exist-

ing infrastructure to industry-standard infrastructure. Factors considered when assessing inventory conditions include the asset's age in relation to its predicted life cycle. An inventory of terminal conditions should be prepared periodically with notes on maintenance costs, frequency of repair, and position in the component's life cycle. The inventory of conditions should be updated in preparation for analyzing terminal redevelopments and as part of annual updates to the airport's CIP.

Functionality

In addition to a terminal approaching the end of its infrastructure service life, terminal redevelopment may be motivated by changed operational and functional requirements that cannot be reasonably accommodated by an existing facility. Examples of operational changes include changes in airline lobby ticketing from agent-assisted services to self-ticketing kiosks, increasing acceptance of common use facilities, heightened security, airline consolidation, global alliances, and hub and spoke airline networks. From the preceding list, two areas of change continue to have profound effects on terminals:

- Changes in systems or equipment, specifically those resulting from technological advances, contribute to accelerating obsolescence of existing terminal infrastructure. Examples of recent changes include numerous airline initiatives to expand wireless communication systems, which enable individuals to complete transactions using smart phones, often bypassing fixed infrastructure. In some cases, existing terminal infrastructure can limit benefits from adopting new technologies; for example, older designed baggage handling systems that do not have automated sortation capabilities are unable to support centralized explosives detection screening systems or fully incorporate potential benefits from common use check-in technology.
- Regulatory changes can have pronounced effects on how passengers experience terminal infrastructure. Significant examples include security changes regarding the screening of passengers and their baggage as well as the processing of international passengers arriving into the United States.

References

- *ACRP Report 25: Airport Passenger Terminal Planning and Design: Vol. 1: Guidebook and Vol. 2: Spreadsheet Models and User's Guide*, 2010.
- *ACRP Report 10: Innovations for Airport Terminal Facilities*, 2008.

Capital Improvement Program

Airport operators typically prepare two high-level annual budgets: one for planned operating expenditures (i.e., operating expenses and revenues) and another for required and/or desired capital investments. The latter budget is typically referred to as the CIP, which details desired investments planned for the next 5 to 10 years. The level of capital investment depends on a number of factors, including:

- Age and condition of facilities, equipment, and systems
- Need for new or expanded facilities based on capacity needs
- Sustainability initiatives
- Regulatory requirements
- Market and service area changes
- Technology
- Current and future funding availability, including affect on bond ratings
- Stakeholder input and concurrence/approvals
- Follow-on effects on operation and maintenance (O&M) costs
- Economic environment

Table 5-1 (1 of 2)

Summary of Contributing Factors that Influence Terminal Redevelopment Planning

Contributing Factors in Evaluation	Principles to Guide Evaluation	Tools for Evaluation
Business Conditions		
Governance		
<ul style="list-style-type: none"> • Authority vs. Municipal • Airline Agreement - Control over CIP 	<ul style="list-style-type: none"> • All levels of management should be engaged at strategic milestones of the terminal renew/replace analyses. 	<ul style="list-style-type: none"> • Reference - ACRP Report 36: Airport/Airline Agreements—Practices and Characteristics, 2010
Historical/Current Market Conditions		
<ul style="list-style-type: none"> • Aviation Activity • Airline(s) Hub or Focus City • International Service 	<ul style="list-style-type: none"> • Evolving activity characteristics should be used in defining terminal adequacy and need. 	<ul style="list-style-type: none"> • References - ACRP Report 25: Airport Passenger Terminal Planning and Design: Vol. 1: Guidebook and Vol. 2: Spreadsheet Models and User's Guide, 2010.
Aviation Activity Forecasts		
<ul style="list-style-type: none"> • Demand Stability/Assumptions - Passenger Characteristics (Origin and Destination (O&D) Share) - Fleet Mix 	<ul style="list-style-type: none"> • Historical aviation activity and anticipated growth is the primary driver of level of service and future facility requirements. 	<ul style="list-style-type: none"> • References - ACRP Report 25: Airport Passenger Terminal Planning and Design: Vol. 1: Guidebook and Vol. 2: Spreadsheet Models and User's Guide, 2010 - FAA TAF - Airport Master Plan
Strategic Plan		
<ul style="list-style-type: none"> • Mission Statement • Vision Statement • Airport's Strengths, Weaknesses, Opportunities, and Threats (SWOT) • Definition of Strategic Issues • Long- and Short-Term Goals, Strategies, and Action Plan 	<ul style="list-style-type: none"> • A proactive approach should be undertaken to define the airport's future and formulate a roadmap to guide the organization from its current state to the airport operator's vision for the future. • A Strategic Plan is prepared to assess the airport's actual performance and compare it with its potential performance in order to define its needs. 	<ul style="list-style-type: none"> • Reference - ACRP Report 20: Strategic Planning in the Airport Industry, 2009. • Tools - Scenario Planning - SWOT Analyses - Top Rated Objectives
Performance Indicators		
Financial Capacity		
<ul style="list-style-type: none"> • Quantifying Current Funding Commitments and Future Funding Availability - FAA Airport Improvement Program (AIP) Grants (Entitlement and Discretionary) - Other Federal Funding (e.g., TSA) - Passenger Facility Charges (PFC) (Pay-As-You-Go and Leveraged) - Customer Facility Charges (CFC) - State or Local Government Funds - General Airport Revenue Bonds - Other Debt - Airport Discretionary Funds (Cash) - Third-Party/Private Funding 	<ul style="list-style-type: none"> • Ensure that an appropriate balance is maintained among an airport's capital needs, an airport enterprise's ability to pay for capital projects, and the reasonableness of rates and charges to airport tenants. 	<ul style="list-style-type: none"> • Tools - Debt Capacity Analysis - Rates and Charges Models - Cash Flow Models - Sensitivity Analyses - Benefit-Cost Analyses/Justification - Industry Financial Metric Benchmarking • Key Metrics - Airline Cost per Enplaned Passenger - Debt Service Coverage Ratios - Bond Ratings - Other Financial Ratios/Metrics - Airport Operator Liquidity - Balance Sheet

(continued on next page)

Table 5-1 (2 of 2)

Summary of Contributing Factors that Influence Terminal Redevelopment Planning

Contributing Factors in Evaluation	Principles to Guide Evaluation	Tools for Evaluation
Revenue Growth and Diversification <ul style="list-style-type: none"> • Other Airport Competition • Off-Airport Competition • Aeronautical vs. Non-aeronautical Revenue • Maximizing Use of Airport Assets 		
Facility Conditions		
Mission <ul style="list-style-type: none"> • Capability <ul style="list-style-type: none"> - Landside - Airfield - Terminal Apron • Aircraft Parking/Terminal Servicing • Functionality • Passenger Level of Service and Capacity 	<ul style="list-style-type: none"> • See Strategic Plan. • Project objectives must be clearly defined and adhere to the justifications for the project. 	<ul style="list-style-type: none"> • References <ul style="list-style-type: none"> - FAA and International Air Transport Association Design Guidelines - ACRP Report 25: <i>Airport Passenger Terminal Planning and Design: Vol. 1: Guidebook and Vol. 2: Spreadsheet Models and User's Guide</i>, 2010 • Tools <ul style="list-style-type: none"> - ACRP Report 25: <i>Vol. 1: Guidebook and Vol. 2: Spreadsheet Models and User's Guide (Facility requirements spreadsheet)</i>, 2010 - Gap Analyses
Inventory Conditions <ul style="list-style-type: none"> • Asset Age and Condition • Life Safety and Security Compliance • Building Performance/Utilization <ul style="list-style-type: none"> - Energy Use, Environmental, and Other Regulatory Issues - Space Utilization and Function 		
CIP Development <ul style="list-style-type: none"> • Activity Timing • Land Availability • Design Alternatives • Costs <ul style="list-style-type: none"> - One-Time: facility investment; value of existing assets employed or replaced; residual value. - Recurring: O&M; Personnel • Benefits <ul style="list-style-type: none"> - Enhanced Revenues - Direct Savings - Efficiency Increases - Other Quantifiable and Non-quantifiable Outputs 	<ul style="list-style-type: none"> • Link facilities to the airport's business strategy. • All reasonable alternatives to satisfy a given program objective must be investigated. • Alternatives must be considered in terms of their life-cycle (total) costs and benefits. • Provide clear definition of the project and document factors and assumptions used to make the decision. 	<ul style="list-style-type: none"> • References <ul style="list-style-type: none"> - ACRP Report 49: <i>Collaborative Airport Capital Planning Handbook</i>, 2011 - International Facility Management Association, <i>White Paper on Strategic Facility Planning</i> • Tools <ul style="list-style-type: none"> - Brainstorming - Life-Cycle (Total Cost) Analyses - Benefit-Cost Analyses

Source: Ricondo & Associates, Inc., June 2011.
Prepared by: Ricondo & Associates, Inc., June 2011.

The extent of planning and cost-estimate preparation for the CIP depends on the project. Sources of estimates include:

- Equipment pricing
- Planning stage rough order-of-magnitude estimates; design stage cost estimates

Planning for a renewal or replacement terminal project must consider both related and unrelated CIP projects as some may be incorporated in the project while others may be made unnecessary or require rescheduling. Table 5-1 summarizes the contributing factors discussed above.

Reference

- *ACRP Report 49: Collaborative Airport Capital Planning Handbook, 2011.*



PART 3

Evaluation Process and Organization

Overview of the Evaluation Process

This chapter provides an overview of a business-driven approach to evaluating competing options for terminal renewal or replacement as opposed to a strictly cost-driven approach. The overview addresses when an airport operator should conduct the evaluation within the context of the larger planning process that leads to a defined capital improvement plan (CIP). The participants and their roles throughout the evaluation are also discussed in this chapter.

When to Conduct an Evaluation

The evaluation of options for terminal renewal versus replacement is, in reality, only one phase of a larger planning process undertaken by an airport operator in redeveloping a terminal. Optimally, the evaluation should be conducted as part of the airport strategic or master planning process, as illustrated on Exhibit 6-1.

Recommendations resulting from the evaluation of competing options for terminal renewal or replacement should be incorporated into the airport's Master Plan and CIP. Alternatively, the evaluation could be conducted subsequent to the Master Plan and be used to validate the Master Plan recommendations. Under either approach, the evaluation process, by definition, must occur after the airport's mission and business objectives are defined since the purpose of the evaluation process is to align future capital investments in terminal redevelopment with the airport operator's strategic and business objectives.

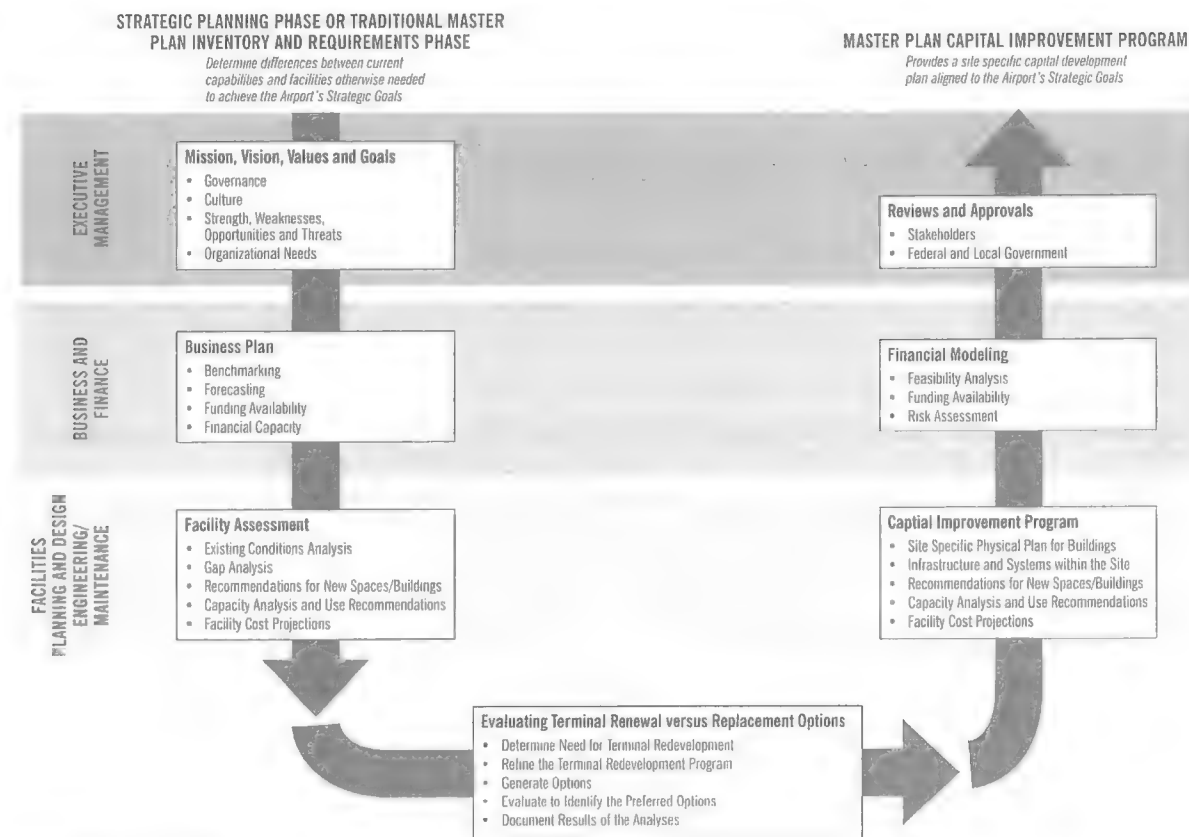
Implementing a business approach to evaluating the options of renewing or replacing terminal facilities requires a methodical process and the use of analytical techniques to produce the three components needed to take action, as follows:

- A strategic business plan
- A gap analysis representing the differences between current facility capabilities and capabilities needed to achieve strategic goals
- An achievable and affordable plan to meet airport needs. Consequently, the process necessarily involves components typically associated with strategic facilities planning to effectively link facilities to the airport operator's core business strategies and vision.

A prerequisite for successfully undertaking a Terminal Redevelopment Program is achieving consensus among the airport's stakeholders regarding the need for terminal redevelopment.

Basic Principles for Conducting an Evaluation

The different stakeholders involved in the overall terminal planning process and, specifically, the evaluation of alternative terminal options share key goals, but individually have different perspectives in terms of the priorities of a project's goals and objectives. Nevertheless, interviews

Exhibit 6-1**Evaluation of Terminal Options in the Context of Overall Terminal Redevelopment Planning****When to Evaluate Option for Terminal Renewal or Replacement**

Source: Ricondo & Associates, Inc., June 2011.
 Prepared by: Ricondo & Associates, Inc., June 2011.

conducted with representatives from a range of different size airports uncovered fundamental precepts that can be considered guiding principles for conducting a thorough evaluation of competing terminal redevelopment options:

- Provide a clear statement of the project objectives.
- Investigate all reasonable alternatives to satisfy a given program objective that conforms to the airport's Strategic Plan.
- Consider alternatives in terms of their life-cycle (total) costs and operational and functional benefits.
- Ensure documentation of all assumptions and factors that contribute to decisions.
- Ensure that an appropriate balance is maintained among an airport's capital needs, the airport enterprise's ability to pay for capital projects, and airline affordability.

Airport Operator and Stakeholder Roles

Redeveloping terminal facilities involves stakeholders with different and sometimes competing priorities. To be successful, the evaluation process requires the commitment of the airport's governing body to conduct an evaluation of terminal redevelopment options; active participa-

tion at all levels of the airport's executive, business, facilities, and operational units; and regular interface with all significant stakeholders, particularly the airlines and federal and local agencies.

Under certain conditions, an airline will act as the principal advocate for terminal redevelopment and manage the redevelopment and evaluation process. In this case, the airline would assume the roles prescribed for the airport's Facilities Planning/Design and Engineering departments. The airport operator would retain an oversight role and coordinate between the terminal redevelopment and corollary developments simultaneously occurring at the airport. More commonly, the airport operator acts as the principal advocate for terminal redevelopment.

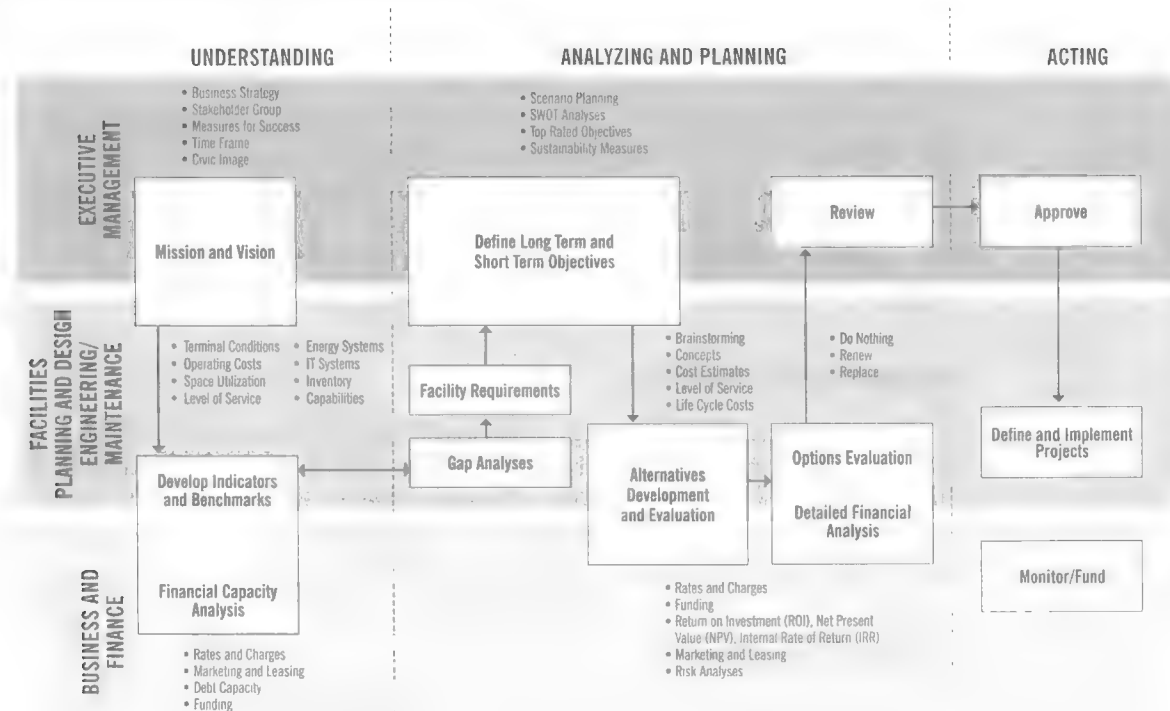
The International Facilities Management Association defines the key stages in the facilities planning process as:

- **Understanding:** Thoroughly understanding the organization's mission, vision, values, and goals.
- **Analyzing:** Applying analytical techniques to explore possible scenarios and triggers to determine facility needs.
- **Planning:** Developing plans that meet long-range needs.
- **Acting:** Implementing the plan(s).

Exhibit 6-2 correlates an airport's typical organizational units to the sequence of tasks that must be completed in a planning process for terminal redevelopment. Different organizational

Exhibit 6-2

Airport Roles in the Terminal Planning Process



Terminal Facility Renewal Versus Replacement Evaluation Process

units should bear primary responsibility based on their access to information and technical expertise. The following subsections discuss the roles of the key participants in the overall planning process for terminal redevelopment.

Policy Makers/Board of Directors/Executive Management

The primary role of these entities is the establishment of airport (and project) goals and objectives, the airport's mission and vision (ideally captured in the airport's Strategic Plan), and oversight and staff direction. Policy makers, boards of directors, and executive management are most involved early in the project, setting goals, assignments, direction, and schedule; coordinating with civic leaders and airport boards or city councils; reviewing and approving alternatives and evaluations; and, finally, approving the final solution and funds for the project.

Depending on the airport/airline agreement, an airport operator may be required to do one or more of the following as part of the airline consultation process:

- Conduct a meeting with the signatory airlines to present the capital project.
- Provide written justification for the capital project.
- Provide cost estimates and a funding plan for the capital project.
- Provide drawings and a time schedule for the capital project.
- Estimate the financial impacts on the airlines resulting from the capital project (including capital cost, operating expense, and nonairline revenue impacts).
- Allow a certain period of time for the signatory airlines to assess the capital project and submit their approval/disapproval, which is also referred to as majority-in-interest (MII) approval (e.g., 2 weeks, 30 days).

Facilities Engineering and Maintenance

The primary role of Facilities Engineering and Maintenance is operating and maintaining the terminal facility, including repairs and systems replacement when required. These departments are involved throughout the project development period, identifying facility conditions, life-cycle status, and costs to repair, renew, or replace various facility elements. These departments also have a role in defining terminal development phasing requirements, particularly with respect to ongoing operations during construction.

Business and Finance

The primary role of Business and Finance is identifying revenue and funding sources; calculating performance measures related to return on investment, cash flow, and funding requirements and capabilities; and evaluating financial risks of different project options. Additionally, the Business and Finance groups are typically involved in determining how the project may impact airline agreements and in coordinating with the financing team on potential bond issue requirements.

Airline Consultation

Airlines need to achieve profitability in an extremely competitive and dynamic industry to have a sustainable operation. While airport rates and charges or even just terminal costs as a percentage of total airline operating costs may not be as considerable as some other expense categories, such as fuel or labor, they are still significant enough to warrant attention. The airlines are important stakeholders in the airports they serve, and it is suggested that their input be considered and that they be consulted early in the process because they are, in many cases, the primary users of terminal and related facilities. The treatment of capital control and con-

sultation provisions is dependent on the overall nature of the airline rate-setting methodology. For example, if the airport operator is taking a larger share of the financial risk, as set forth in the airport/airline agreement, the agreement may provide for limited to no airline control over capital development. However, under a more residual-type business arrangement, the airport/airline agreement generally contains a stricter application of control and consultation provisions.

Other Stakeholders

Other stakeholders figure prominently in various phases of the process as well. Federal agencies such as the FAA, the Transportation Security Administration (TSA), and Customs and Border Patrol (CBP) provide standards and requirements for aircraft flows and passenger and baggage processing, respectively, and need to be involved in early phases of project definition as well as space requirements for alternatives and alternative reviews.

Projects may also require community involvement through local and regional planning agencies and building code approval departments and, in some instances, national and state historic preservation offices. Notwithstanding a formal community outreach program conducted as part of a terminal planning process, airport operators increasingly recognize the importance of social media outlets, such as Facebook and Twitter, as sources of real-time user comments concerning the community's experiences with the airport's services and development plans.

Four-Step Evaluation Process

This Guidebook suggests a four-step process for evaluating competing terminal options. The four steps incorporate the previously discussed guiding principles for conducting a thorough and unbiased evaluation. The process represents a methodical approach to ensure that all issues are included and addressed, alternatives are properly defined and evaluated, and the pros and cons of each are presented to relevant stakeholders in an accurate, easy to comprehend format:

- Step 1: Determine Need For Terminal Redevelopment
- Step 2: Refine Terminal Redevelopment Objectives and Generate Options
- Step 3: Evaluate Options
- Step 4: Document Results of the Analyses

Exhibit 6-3 expands on the roles of the airport organizational units, the airlines, other airport tenants, and policy makers in the context of the four-step evaluation process. The roles of these participants are further delineated to define their specific responsibilities or areas of consultation as they relate to macro steps (activities that occur within each of the four steps). Macro steps produce key outputs that are prerequisites to advance the evaluation to a subsequent step.

Exhibit 6-3 additionally presents estimates of the time needed to complete each step, which users of the Guidebook will necessarily have to adjust to the airport's unique conditions.

Sample Case—City Airport

An example terminal redevelopment case, referred to in this Guidebook as City Airport, is used herein to facilitate an understanding of the techniques and tools used to evaluate competing development options. Specific to this Guidebook, City Airport represents a typical mid-sized airport and terminal facility with defined characteristics. The City Airport example is intended to enhance user recognition of the process, techniques, and specific tools used in the

Exhibit 6-3

Involvement and Responsibilities

STEP 1: DETERMINE NEED FOR TERMINAL REDEVELOPMENT				STEP 2: REFINE TERMINAL REDEVELOPMENT OBJECTIVES AND GENERATE OPTIONS				STEP 3: EVALUATE OPTIONS				STEP 4: DOCUMENT RESULTS OF THE ANALYSES			
STAGES				STAGES				STAGES				STAGES			
ROLES				ROLES				ROLES				ROLES			
Facilities Engineering/Maintenance				Facilities Planning and Design				Business and Finance				Airport Operations, Airlines, Commercial Tenants, Regulatory Agencies, and Other Stakeholders			
Monitor and report on building and systems condition, existing operating and repair costs and trends, space utilization, minimum and desired building condition characteristics				Prepare preliminary terminal performance studies, primary issues, recommendations, and a preliminary program to address the program needs and characteristics				Consult on facilities conditions and inventories				Consult on facilities conditions and inventories			
Identify performance benchmarks, industry trends, and opportunities, including regulatory environment				Prepare preliminary terminal performance studies, primary issues, recommendations, and a preliminary program to address the program needs and characteristics				Consult on capital improvement program				Consult on capital improvement program			
Prepare financial status and outlook, industry benchmarks and risk analysis				Provide airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)				Provide airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)				Provide airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)			
Request terminal alterations and on terminal conditions				Request terminal alterations and on terminal conditions				Request terminal alterations and on terminal conditions				Request terminal alterations and on terminal conditions			
Prepare airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)				Prepare airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)				Prepare airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)				Prepare airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)			
Assess airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)				Assess airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)				Assess airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)				Assess airport strategic plan, regulatory strategy, objectives and performance goals, stakeholder and community outreach (ACRP Report 20, 2010)			
Board of Directors/Policy Makers				Board of Directors/Policy Makers				Board of Directors/Policy Makers				Board of Directors/Policy Makers			
Key Process Outputs				Key Process Outputs				Key Process Outputs				Key Process Outputs			
Airport strategic plan, mission and vision, strengths/weaknesses/opportunities, strategic performance targets, consensus for need for major terminal redevelopment program				Airport strategic plan, mission and vision, strengths/weaknesses/opportunities, strategic performance targets, consensus for need for major terminal redevelopment program				Airport strategic plan, mission and vision, strengths/weaknesses/opportunities, strategic performance targets, consensus for need for major terminal redevelopment program				Airport strategic plan, mission and vision, strengths/weaknesses/opportunities, strategic performance targets, consensus for need for major terminal redevelopment program			
Non-Hub: 3 to 6 Months				Non-Hub: 3 to 6 Months				Non-Hub: 3 to 6 Months				Non-Hub: 3 to 6 Months			
Small Hub: 6 to 9 Months				Small Hub: 6 to 9 Months				Small Hub: 6 to 9 Months				Small Hub: 6 to 9 Months			
Medium Hub: 9 to 12 Months				Medium Hub: 9 to 12 Months				Medium Hub: 9 to 12 Months				Medium Hub: 9 to 12 Months			
Large Hub: 9 to 18 Months				Large Hub: 9 to 18 Months				Large Hub: 9 to 18 Months				Large Hub: 9 to 18 Months			
Typical Timeline Ranges				Typical Timeline Ranges				Typical Timeline Ranges				Typical Timeline Ranges			
Non-Hub: 3 to 6 Months				Non-Hub: 3 to 6 Months				Non-Hub: 3 to 6 Months				Non-Hub: 3 to 6 Months			
Small Hub: 6 to 9 Months				Small Hub: 6 to 9 Months				Small Hub: 6 to 9 Months				Small Hub: 6 to 9 Months			
Medium Hub: 9 to 12 Months				Medium Hub: 9 to 12 Months				Medium Hub: 9 to 12 Months				Medium Hub: 9 to 12 Months			
Large Hub: 9 to 18 Months				Large Hub: 9 to 18 Months				Large Hub: 9 to 18 Months				Large Hub: 9 to 18 Months			
Primary				Primary				Primary				Primary			
Support				Support				Support				Support			
Decision Making				Decision Making				Decision Making				Decision Making			
Executive summary and public review documents, including facility objectives, functional and spatial requirements, planning concept, implementation strategy, capital program costs, and financial model				Executive summary and public review documents, including facility objectives, functional and spatial requirements, planning concept, implementation strategy, capital program costs, and financial model				Executive summary and public review documents, including facility objectives, functional and spatial requirements, planning concept, implementation strategy, capital program costs, and financial model				Executive summary and public review documents, including facility objectives, functional and spatial requirements, planning concept, implementation strategy, capital program costs, and financial model			
1 Month				1 Month				1 Month				1 Month			
1 Month				1 Month				1 Month				1 Month			
1 Month				1 Month				1 Month				1 Month			
2 Months				2 Months				2 Months				2 Months			

evaluation. Moreover, the City Airport example will facilitate user understanding of sources of data, associate separate analyses that may be undertaken by different groups involved in the evaluation, and be used to interpret the analyses in terms of an airport's Strategic Plan or Master Plan.

Exhibit 6-4 and Exhibit 6-5 illustrate the layout of the City Airport terminal, including general site plan, aircraft parking plan, and upper and lower level terminal floor plans. The assumed characteristics of the terminal and its conditions are summarized as:

- The City Airport is sized as a medium-hub airport with 20 gates. The airport principally supports a narrow body and regional aircraft fleet mix.
- The terminal is characterized by a single level landside with two bi-level concourses.
- The City Airport Master Plan is more than 5 years old, recommends a new expanded terminal, but recent activity does not justify expansion.
- The terminal was originally built in the 1950s with three subsequent expansions/refurbishments. The latest expansion was 10 years ago and included a new roof and rooftop heating, ventilation, and air conditioning (HVAC) system, expanded security area, and refurbished concession areas.
- Current passenger security area does not meet TSA standards. Checked baggage is screened using explosives detection systems located adjacent to airline baggage makeup carousels.
- The City controls five gates serving three nonsignatory airlines, including one low-cost carrier. Fifteen remaining gates are on long-term lease to legacy airlines.

Exhibit 6-4

City Airport - Existing Terminal Area Plan

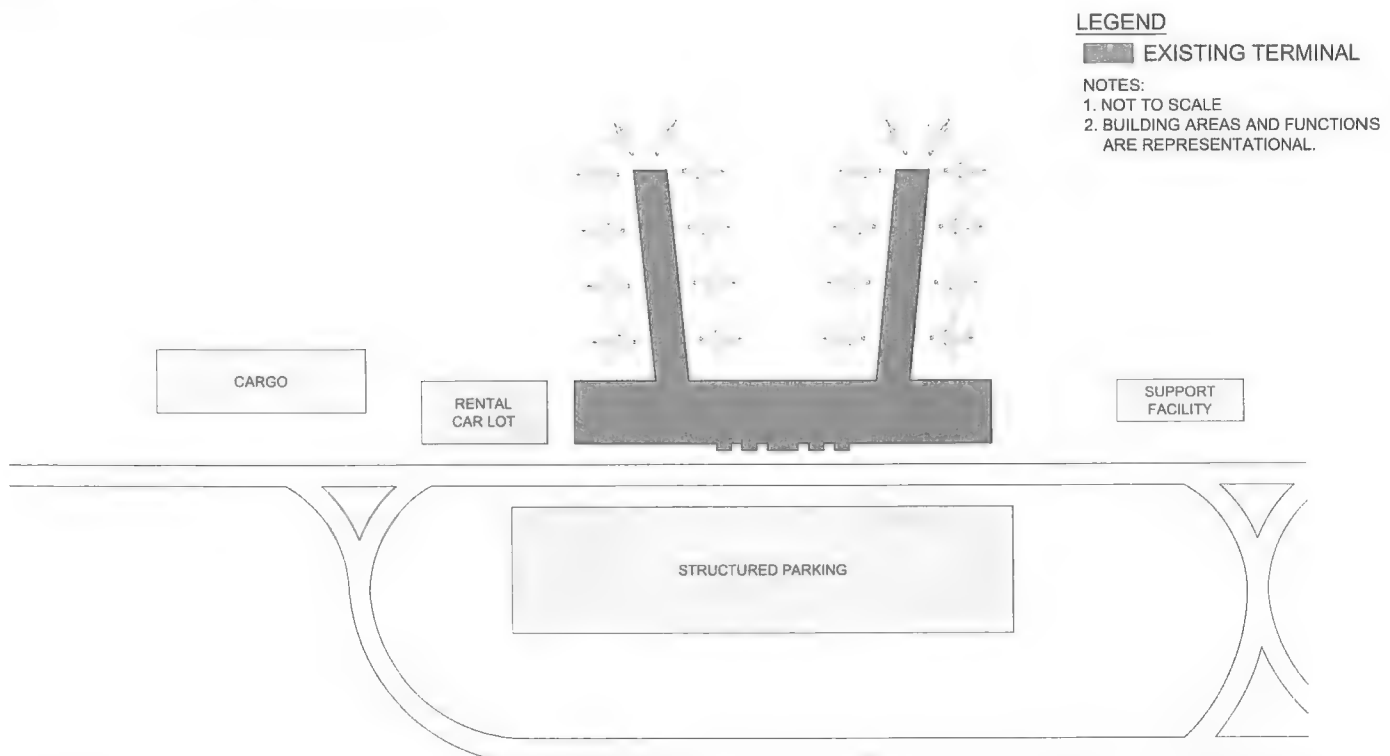
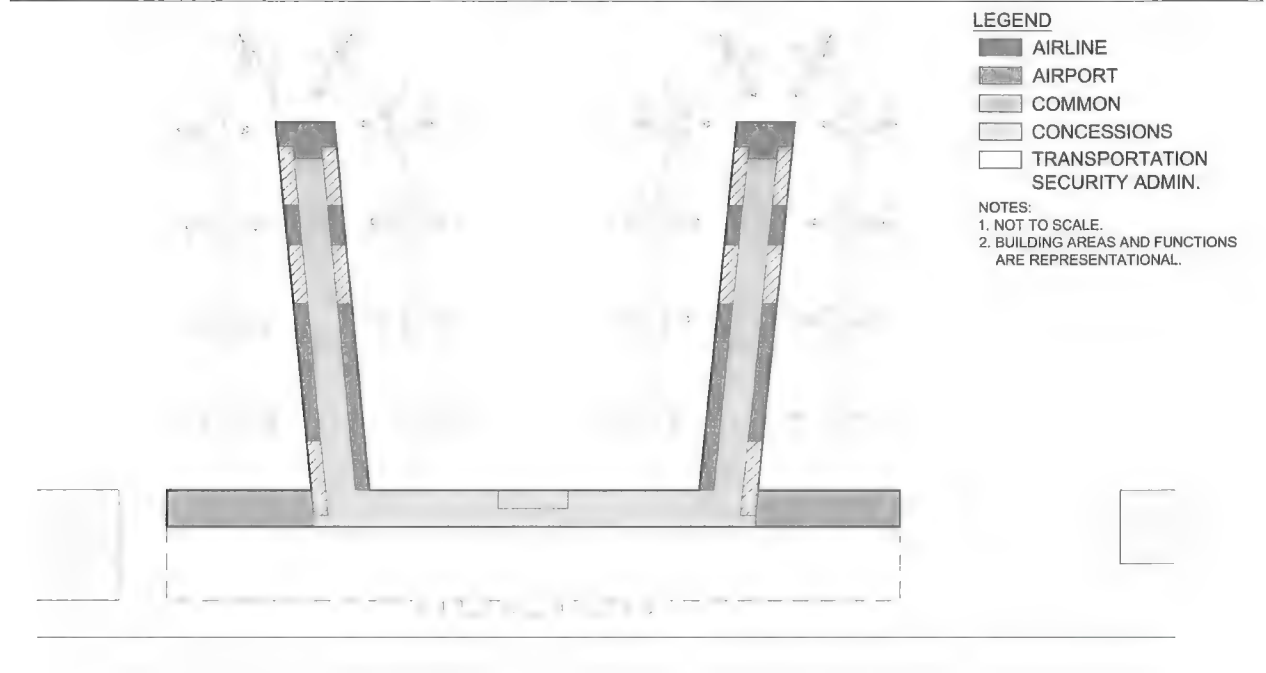


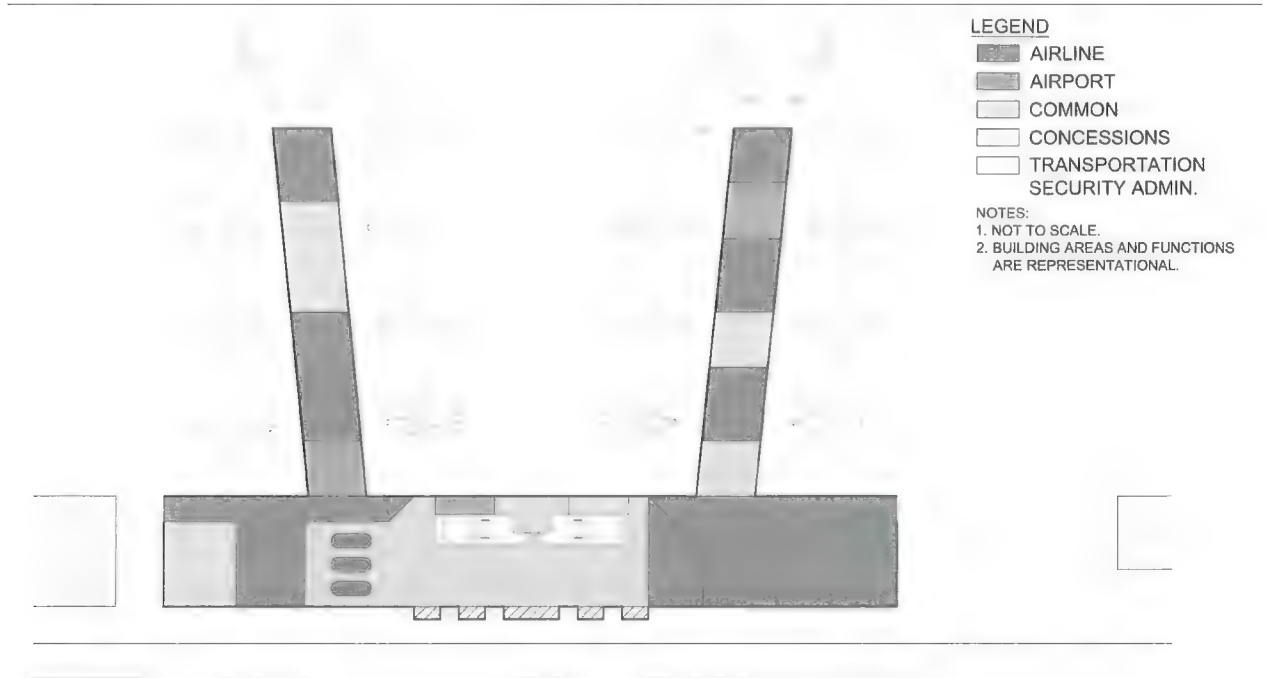
Exhibit 6-5

City Airport - Existing Terminal Building Plans

Upper Level Floor Plan



Lower Level Floor Plan



Step 1: Determine Need for a Terminal Redevelopment

The principal goal of Step 1 is to determine if a need exists for a comprehensive Terminal Redevelopment Program that would either extend the useful life of an existing terminal another 10 to 30 years, or replace the terminal. To achieve this goal, Step 1 involves two major tiers of analysis, as follows:

- Identify the gap between existing terminal conditions and capabilities needed to achieve the airport operator's strategic goals and objectives.
- Determine the financial capacity of the airport enterprise to fund a Terminal Redevelopment Program.

Through the Step 1 process, consensus is built between the airport operator and the airlines serving the airport regarding the scope of needed terminal improvements.

Exhibit 7-1 illustrates the sequence of analysis and points in the sequence when analyses conducted by different organizational units should be correlated and reviewed with stakeholders or decision makers.

The first tier of analysis under Step 1 requires participants to understand the airport's Strategic Plan or Master Plan and to identify the gaps between existing terminal capabilities and those needed to achieve the airport operator's strategic goals and objectives. This involves:

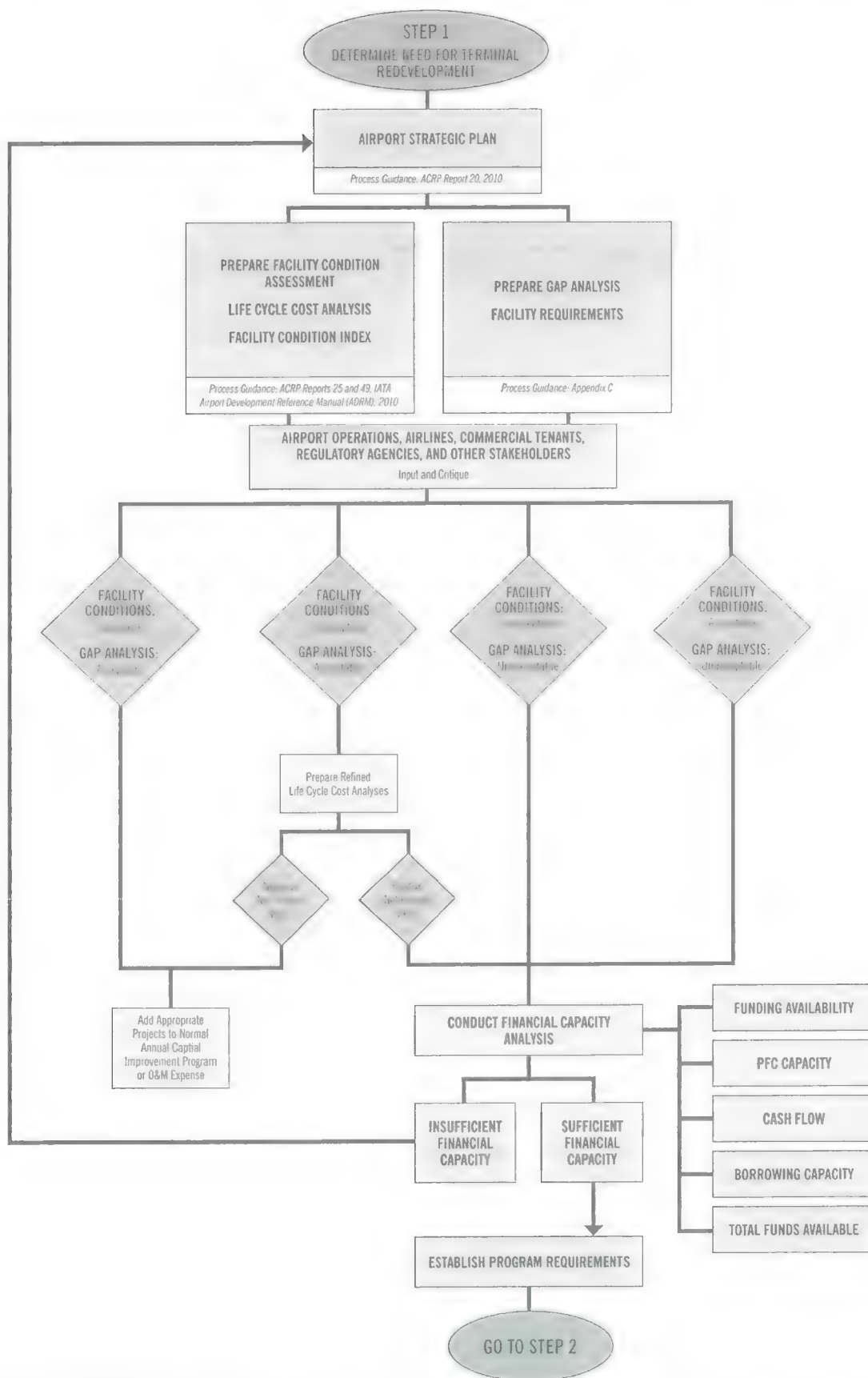
- Gathering data and assessing the condition of existing terminal assets
- Determining requirements needed to align terminal capabilities with the airport operator's strategic objectives for the airport's mission, competitiveness, forecast activity levels, level of service, and regulatory compliance

Exhibit 7-1 identifies several outcomes that could result from the first tier analyses:

- When both facility conditions and requirements are at *acceptable* levels within the timeframe specified for the analysis, then it is not necessary to undertake a major Terminal Redevelopment Program.
- When both facility conditions and requirements are at *unacceptable* levels, then a financial capacity analysis should be undertaken to determine the financial capacity of the airport enterprise.
- Similarly, when facility requirements are at *unacceptable* levels, but facility conditions are at *acceptable* levels, then a financial capacity analysis should also be undertaken.
- When overall facility conditions are at *unacceptable* levels, but facility requirements are at *acceptable* levels, a benefit–cost analysis (BCA) should be undertaken to compare the costs and savings among options to continue “preventative” maintenance versus system replacement. In this situation, an airport's terminal is most likely reaching the end of its useful life in terms of major building systems, yet able to meet operational requirements. If the BCA indicates a positive net present value or a life-cycle cost analysis (LCCA) indicates savings from replacement, then a financial capacity analysis should be undertaken.

Exhibit 7-1

Step 1 Process Diagram



The second tier of analysis involves a financial capacity analysis to estimate the resources available to undertake a terminal redevelopment project. Exhibit 7-1 identifies the principal inputs to the financial capacity analysis. Two outcomes could result from the analysis:

- A finding of insufficient capacity to overcome the facility conditions and requirements gap—identified from the first tier analyses—would require reconsideration of the airport operator’s strategic objectives. This is an unlikely finding if the airport operator developed its Strategic Plan or Master Plan using available guidelines.
- A finding of available capacity would allow participants to refine a Terminal Redevelopment Program and develop consensus among stakeholders and decision makers to advance to Step 2 of the evaluation process.

The following delineates the different analyses and techniques referenced by Exhibit 7-1.

Strategic Plan

In general terms, strategic planning is the process undertaken by an organization to define its future and formulate a road map to guide the organization from its current state to management’s vision for the future. Airport operators should reference the 2009 *ACRP Report 20: Strategic Planning in the Airport Industry*, for guidance on the preparation of a Strategic Plan.

The strategic planning framework includes the following key elements:

- A mission statement that identifies the organization’s purpose and its core values (a separate values statement may also be created)
- A vision statement that portrays the organization’s future goal(s)
- Identification of the organization’s strengths, weaknesses, and opportunities, as well as threats that may affect the organization
- Definition of issues that must be addressed within the Strategic Plan
- A set of generic and grand strategies, long- and short-term objectives, and action plans that provide a road map for addressing the gaps between the organization’s current state and management’s vision
- Definition of key performance indicators (measures and targets) to evaluate the progress toward achieving management’s long- and short-term objectives

Table 7-1 lists the grand strategies and near-term facility objectives described in the Strategic Plan for the City Airport example.

Table 7-1

City Airport Strategic Plan

Grand Strategies

- Provide facilities to meet future community needs and expectations.
- Maintain an airport cost of operation (e.g., cost per enplaned passenger) that is reasonable for current and future airlines serving the airport.
- Promote a high level of service through facility improvements and operating standards that encourages activity growth and service to new markets.

Near-Term Facility Objectives

- Provide attractive and free flowing terminal curbsides.
- Provide modern check-in lobby with adequate cross circulation and a high level of passenger service.
- Provide an efficient and worry free security screening process.
- Provide a full array of concession services for passengers on arriving and departing flights.
- Resize aircraft parking positions to provide flexibility for the airlines.

Facility Condition Assessment

A Facility Condition Assessment (FCA) of the terminal building provides an inventory of the terminal spaces and a survey of its utilities, architectural, engineering, and special systems infrastructure to identify deficiencies, project priority of repairs or replacements, and estimate the cost to correct deficiencies.

Table 7-2 represents a summary table from the FCA for the City Airport's terminal, as developed by the airport's engineering and maintenance groups. The FCA summary table incorporates several evaluation criteria to develop a priority rating for individual building systems. Systems with high priority ratings (those at the top of the list) require additional analyses. When more costly systems have a high priority rating, costs to rehabilitate those systems may be closer to the cost of replacement; consequently, further analyses using LCCA should be conducted to compare the cost and savings among options to continue maintenance versus replacement of the systems. The following paragraphs present a discussion of the criteria used by the City Airport's engineers to evaluate the terminal building systems.

Terminal System Description

The list of major assets (facility components and systems) should be assembled, without being too extensive or overwhelming, and organized according to the standard building breakdown structure. A typical organization of components would follow "Unifomat" categories. Depending on the assessment, certain building categories could be expanded to develop a bottom-up assessment of the overall system. The exterior closure category, for example, consists of different types of materials that have different maintenance requirements and useful life expectancies. The specific components that might make up the exterior enclosure could be expanded to include windows, curtainwalls, metal siding, brick/masonry, and doors.

Useful Life

In reality, the useful life of terminal systems can vary substantially depending on use and the environment. Table 7-3 lists the published useful lives of building components and systems typically found in terminal buildings. The sources below provide information pertaining to the useful lives of building components:

- **Manufacturer Literature:** This is most reliable if the testing to determine the life expectancy was conducted by an outside independent organization.
- **Trade Organizations and Publications:** Many trade organizations (e.g., roofing) have information on the life expectancy of various types of roofs, which can be specific to the geographical area.

Age and Age Factor

The age of each building system or component can typically be acquired from construction or maintenance records. The age factor is derived using the following formula, which considers the age of a building system relative to its useful life:

$$\text{Age Factor} = \text{Age} / \text{Useful Life} \times 10 \text{ (rounded to 1 decimal place)}$$

Building System Condition

Information on building system maintenance history and reliability can be used to establish the overall condition of each building system. Table 7-4 presents the rating matrix used to correlate reliability and maintenance. The matrix can be used to rate the condition of any building system using a value system associating "1" with good conditions and "5" with poor conditions.

Table 7-2

City Airport—Prioritized Facility Condition Assessment

Terminal System	Useful Life (years) ¹ [A]	Age ² (years) [B]	Age Factor ³ [C] = 10*[B] / [A]	Condition ⁴ [D]	Performance ⁵ [E]	Priority Rating ⁶ [F] = [C] + [D] + [E]	Estimated Cost of Repair ⁷ (\$ millions)
Baggage Systems	10	15	15.0	4.0	4.0	23.0	\$62.7
Terminal Apron Pavement	20	30	15.0	4.0	3.0	22.0	\$25.1
Mechanical / Electrical Infrastructure	30	30	10.0	3.0	3.0	16.0	\$7.5
Terminal Curbs and Roadway	20	30	15.0	2.0	1.0	18.0	\$5.0
Furniture, Fixtures, and Equipment	15	15	10.0	4.0	4.0	18.0	\$5.0
Public Restrooms	10	15	15.0	2.0	1.0	18.0	\$3.8
HVAC System	20	15	7.5	4.0	4.0	15.5	\$3.8
Passenger Loading Bridges	15	15	10.0	2.0	2.0	14.0	\$3.0
Curtainwall	30	30	10.0	2.0	2.0	14.0	\$1.9
Concession Area	15	15	10.0	2.0	2.0	14.0	\$1.3
Lighting	20	15	7.5	3.0	3.0	13.5	\$1.3
Fire / Life Safety Systems	15	15	10.0	2.0	2.0	14.0	\$0.6
Roof	15	15	10.0	2.0	2.0	14.0	\$0.6
Gate Area Flooring (Carpet)	10	10	10.0	2.0	2.0	14.0	\$0.6
Main Corridor Flooring (Vinyl Composition Tile)	20	15	7.5	2.0	2.0	11.5	\$0.4
Signage	20	15	7.5	2.0	1.0	10.5	
Structure	50	30	6.0	2.0	2.0	10.0	
Information Technology / Flight Information Display System / Baggage Information Display System	10	5	5.0	2.0	2.0	9.0	
Security	10	5	5.0	2.0	2.0	9.0	
Total Estimated Cost of Repair ⁷							\$122.6
Total Estimated Cost to Replace Facility Condition Index ⁸							\$278.3 44.1%

Notes:

¹Useful Life is the approximate number of years that the asset is expected to function as required.

²Age is the number of years the asset has been in use since initial installation or full replacement.

³Age Factor = (Age/Useful Life) x 10.

⁴The Condition rating is based on the cost of maintenance and reliability (Good = 1, OK = 3, Poor = 5).

⁵The Performance rating indicates whether or not an asset functions satisfactorily (Good = 1, OK = 3, Poor = 5).

⁶The Priority Rating is the sum of the Age Factor + Condition rating + Performance rating (0 to 5 = Good, 5 to 10 = Fair, Greater than 10 = Poor).

⁷Estimated Cost refers to the cost required to return the Condition and Performance ratings to "OK."

⁸The generally accepted range of Facility Condition Index for establishing a building's condition is as follows: 0 to 5% = Good, 5 to 10% = Fair, and Greater than 10% = Poor. This standard has been adopted by, among others, the Building Owners and Managers Association, the Council of Educational Facility Planners, and the American University Planners Association.

Source: Ricondo & Associates, Inc., September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

Table 7-3**City Airport—Building System and Component Useful Life**

Building System/Component	Useful Life (years)
Foundation	75
Substructure	50
Superstructure—Frame	75
Superstructure—Slabs and Decks	50
Exterior Closure—Brick/Masonry	75
Exterior Closure—Precast Concrete	75
Exterior Closure—Metal Panels	30
Exterior Closure—Louvers and Screens	15
Exterior Closure—Fixed Glazing	40
Exterior Closure—Curtainwalls	50
Exterior Closure—Exterior Doors	40
Roofing—Built-Up Tar/Asphalt	20
Roofing—EPDM or PVC Membrane	20
Roofing—Copper	50
Roofing—Standing Seam Metal	30
Interiors—Hollow Metal Door	30
Interiors—Ceramic Tile	25
Interiors—Carpet	12
Interiors—Resilient Vinyl Tile	20
Interiors—Terrazzo Floor	50
Interiors—Acoustical Tile Ceiling	15
Conveying Systems—Elevator	30
Conveying Systems—Escalator	15
Conveying Systems—Moving Walk	5
Mechanical—Pumps and Valves	15
Mechanical—Hot Water Generator/Boiler	30
Mechanical—Chiller	25
Mechanical—Cooling Tower	15
Mechanical—Plumbing Fixtures	35
Mechanical—Air Handling Equipment	20
Mechanical—Package/Terminal Units	20
Electrical—Lighting	20
Electrical—Generators	25
Electrical—Communications	15
Electrical—Fire Alarm and Security	15
Equipment—Window Treatment / Blinds	7
Sitework—Light Use Concrete	25
Sitework—Heavy Use Concrete	15

Notes: EPDM = ethylene propylene diene monomer.
PVC = polyvinyl chloride.

Source: Kohnen-Starkey, Inc., June 2011.
Prepared by: Kohnen-Starkey, Inc., June 2011.

Table 7-4

City Airport—Asset Reliability/Condition Matrix

	Maintenance		
	Low	Med	High
Reliability			
Low	3	4	5
Med	2	3	4
High	1	2	3

Source: Kohnen-Starkey, Inc., June 2011.

Prepared by: Kohnen-Starkey, Inc., June 2011.

For example, a system that has a low maintenance history and high reliability will have a condition rating of 1, whereas a system with a high maintenance history and low reliability will have a condition rating of 5. Evaluating a system's reliability is inherently subjective, as the critical nature of a building system, a service elevator, for example, may be considered, whereas evaluating a system's maintenance is more straightforward, as it is documented in maintenance records.

Building System Performance

Whereas building system condition assesses maintenance and reliability, system performance is more subjective. The rating of system performance is usually based on personal observation and feedback; for example, the personal observations of and feedback from gate personnel indicates that the heating, ventilation, and air conditioning (HVAC) system does not cool properly whenever the outside temperature is 85°F (30°C) and hotter.

Facility Condition Index

While not commonly used within the aviation industry, a Facility Condition Index (FCI) can be calculated using information developed as part of the FCA. The FCI represents the total "cost of repairs" divided by the estimated full in-kind replacement cost for the terminal. Table 7-5 presents the framework for interpreting a building's FCI, as promoted by the Building Owners and Managers Association, the Council of Educational Facility Planners, the American University Planners Association, and a number of other national facilities groups. The higher the FCI, the poorer the relative condition of the facility. For example, if a building has a replacement value of \$1,000,000 and has \$100,000 of existing deficiencies, the FCI is $\$100,000/\$1,000,000 = 10$ percent. Where facility asset managers or property managers are responsible for multiple buildings, the FCI provides a framework to compare the conditions of different buildings within a campus or organization; where FCI data are available, they provide the ability to benchmark facilities within the same industry.

The FCA for the City Airport terminal lists the estimated costs to repair system deficiencies identified during surveys. Table 7-6 summarizes the estimated cost for a full in-kind replacement

Table 7-5

City Airport—FCI Definition

Condition	FCI
Good	0 to 5%
Fair	6% to 10%
Poor	10% and above

Source: National Association of College and University Business Officers, 1991, "Managing the Facilities Portfolio: A Practical Approach to Institutional Facility Renewal and Deferred Maintenance."

Prepared by: Ricondo & Associates, Inc., June 2011.

Table 7-6**City Airport—In-Kind Replacement Cost**

Section	Description	Unit	Unit Cost	Percent	Cost per Square Foot	Cost per Item
03	Foundations/Slab-on-Grade	Square Feet	\$15.00	3.3%	\$16.00	\$5,872,000
04	Masonry Partitions	Square Feet	\$20.00	2.1%	\$10.00	\$3,670,000
05	Structural and Miscellaneous Steel	Tons	\$3,000.00	5.1%	\$25.00	\$9,175,000
05	Decorative Metal	Linear Feet	\$250.00	0.7%	\$3.30	\$1,211,100
05	Light Gauge Framing for Metal Panels	Square Feet	\$3.50	0.2%	\$1.00	\$367,000
06	Carpentry/Millwork	Linear Feet	\$900.00	1.6%	\$8.00	\$2,936,000
07	Waterproofing/Damp proofing	Square Feet	\$7.00	1.4%	\$6.60	\$2,422,200
07	Metal Wall Panels/Fiberglass Reinforced Plastic Cladding	Square Feet	\$50.00	4.1%	\$19.80	\$7,266,600
07	Roofing	Square Feet	\$8.00	1.6%	\$7.80	\$2,862,600
07	Fireproofing, Sealants, Expansion Joint Control	Square Feet	\$3.00	0.7%	\$3.20	\$1,174,400
08	Glazing, Curtainwall, Storefronts	Square Feet	\$80.00	6.2%	\$30.00	\$11,010,000
08	Doors, Frames, Hardware	Each	\$1,750.00	0.3%	\$1.50	\$550,500
09	Interior Finishes	Square Feet	\$25.00	6.6%	\$32.00	\$11,744,000
10	Specialties	Each	Varies	1.0%	\$5.00	\$1,835,000
11-12	Equipment/Furnishings	Each	Varies	0.6%	\$3.00	\$1,101,000
14	Elevators/Escalators	Floor	\$40,000.00	0.7%	\$3.30	\$1,211,100
21	Fire Suppression	Square Feet	\$3.80	0.8%	\$4.00	\$1,468,000
22	Plumbing	Square Feet	\$5.50	1.2%	\$6.00	\$2,202,000
23	Heating, Ventilation, and Air Conditioning	Square Feet	\$22.00	5.8%	\$28.00	\$10,276,000
26	Electrical/Communications	Square Feet	\$25.00	6.4%	\$31.00	\$11,377,000
28	Electronic Safety and Security	Square Feet	\$3.50	1.8%	\$8.90	\$3,266,300
31	Earthwork	Square Feet	\$3.00	0.6%	\$2.70	\$990,900
32	Exterior Improvements (New Apron for 250 Feet beyond Building at the Perimeter)	Square Feet	\$20.00	6.2%	\$30.00	\$11,010,000
34	Passenger Boarding Bridges (20)	Each	\$550,000.00	6.2%	\$30.00	\$11,010,000
34	Baggage Handling System (manual feed system)	Linear Feet	\$3,000.00	35.0%	\$170.00	\$62,390,000
Totals				100.0%		\$178,398,700
Component Subtotal					\$486.10	\$178,398,700
General Conditions, Overhead, and Profit				20%	\$97.22	\$35,679,740
Subtotal						\$214,078,440
Architect/Engineer Fees, Project Manager Fees, Contingencies				30%	\$175.00	\$64,223,532
Total Program Costs					\$758.32	\$278,302,000

Notes:

1. Building parameters: Two stories, 16 foot story height, 367,000 square feet.
2. Unit Cost refers to the cost per unit for the section, whereas the Cost per Square Foot refers to cost per building square foot.
3. This is a sample project with relative quantities and costs for presentation purposes only. Seismic adjustments were not considered in this sample.

Sources: Deloitte Consulting, *Commercial Square Foot Building Costs*, Saylor Publications, Inc., 2010; Kohnen-Starkey, Inc., June 2011.
 Prepared by: Kohnen-Starkey, Inc., June 2011.

of the City Airport terminal. The cost to replace the City Airport terminal at its existing size and configuration would be \$278.3 million. If the total cost for repairs is \$122.6 million, the FCI for the City Airport terminal would be 44.1 percent, indicating that the facility is in very poor condition.

Although such information is currently limited, a growing number of surveys can be useful in benchmarking current terminal performance. The 2003 *10 Airport Survey—Energy Use Policies and Programs for Terminal Buildings* conducted by the Clean Airport Partnership, Inc., on behalf of the U.S. Department of Energy provides information from ten major U.S. airports on energy use, policies, and programs for terminal buildings. The surveyed airports are representative of large and medium-hub airports located in different climatic zones throughout the continental United States.

Life-Cycle Cost and Benefit-Cost Analyses

In cases where the FCA identifies terminal systems with high priority ratings and high repair costs, a BCA should be conducted to compare the total life-cycle cost and savings between continuing “preventative” maintenance versus replacing the existing system.

As defined by the Naval Facilities Engineering Command, *Economic Analysis Handbook*, October 1993, the BCA and the LCCA are economic analysis tools that qualify and quantify factors affecting a decision to assist in the decision-making process. A template for conducting a simple BCA or LCCA is provided in Appendix C.

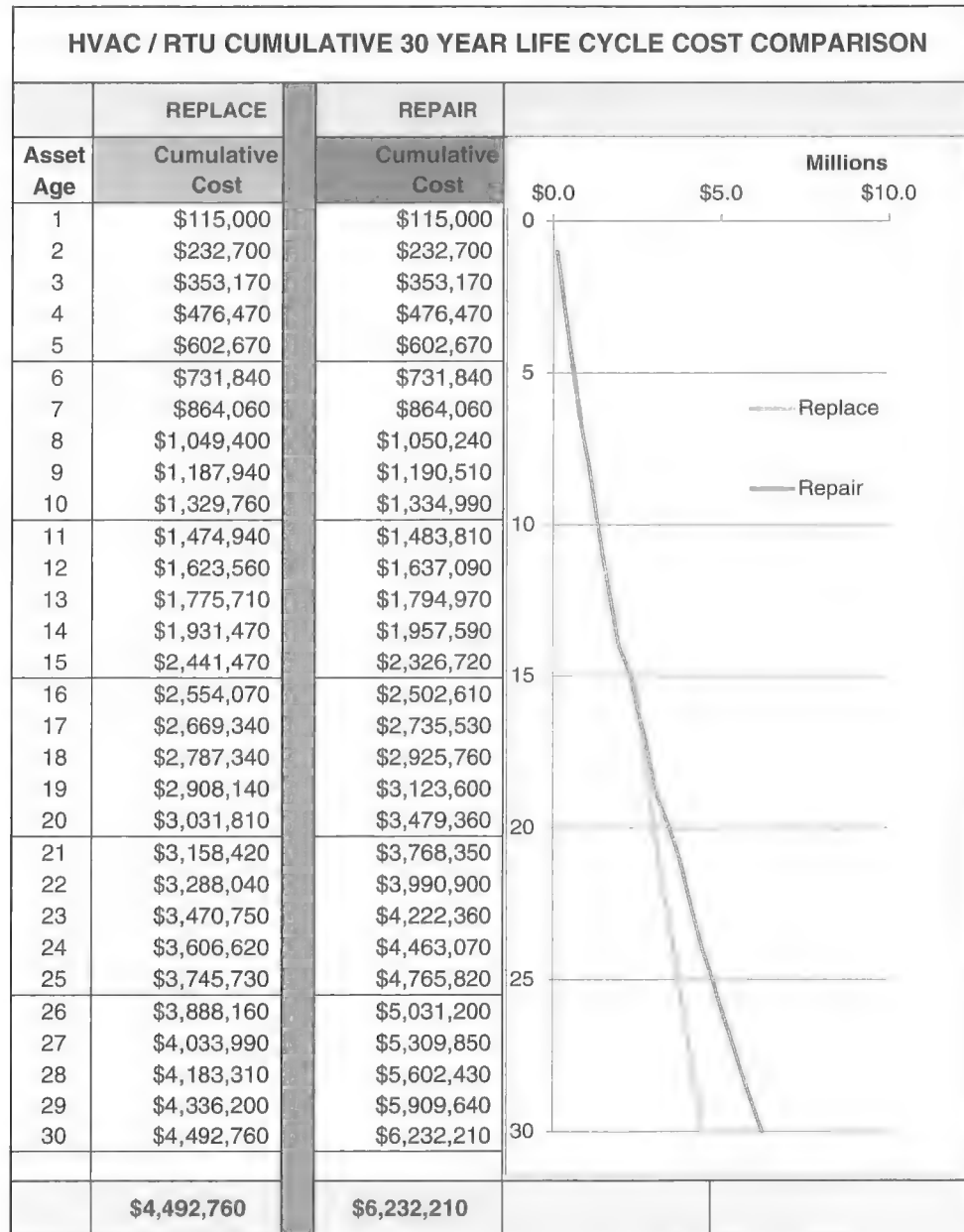
The FCA summary table for the City Airport terminal identified that the mechanical and electrical infrastructure has a very high priority rating and repair costs. At 30 years of age, the terminal’s mechanical and electrical infrastructure had reached the end of its useful life. The City Airport’s Engineering and Maintenance unit prepared an LCCA for the HVAC system to compare the cost of continuing preventative maintenance versus replacement. Exhibit 7-2 and Exhibit 7-3 summarize the results of the analysis and data used as inputs to the LCCA. As indicated in Exhibit 7-2, the cumulative cost of continuing preventative repairs on the existing infrastructure begins to exceed the cost for outright replacement of the existing infrastructure after year eight following installation. Savings from replacing this infrastructure over continuing preventative maintenance, after considering annual O&M and energy costs, and non-annually recurring maintenance costs over 30 years is estimated to be \$1.7 million. Engineering and Maintenance indicated that the replacement option improves reliability and comfort and responds directly to the airport operator’s strategic energy reduction objective by reducing energy costs by nearly \$1.5 million over the analysis period.

Selection of an LCCA or a BCA as the most appropriate analysis tool principally depends on whether competing alternatives yield the same level of service and benefits to the project sponsor:

- An LCCA is appropriately used when competing alternatives yield the same level of service and benefits to the project sponsor.
- A BCA is appropriately used when alternatives would not yield equal benefits.
- A BCA is a useful tool for decision makers in considering whether or not to undertake a project.

To be able to compare the total costs of competing alternatives, basic criteria that should be considered when conducting an LCCA or BCA include:

- Initial (acquisition) costs, complete with all components and installation
- Annual maintenance costs
- Annual energy, fuel, and water costs
- Life expectancy and replacement
- Analysis period

Exhibit 7-2**City Airport—HVAC Comparative Life-Cycle Cost Analysis**

Note: RTU = Rooftop Unit

Source: Kohnen-Starkey, Inc., June 2011.

Prepared by: Kohnen-Starkey, Inc., June 2011.

Exhibit 7-3

City Airport—HVAC Replace versus Repair Life-Cycle Costs

30 YEAR LIFE CYCLE COST OF PACKAGE ROOF TOP UNITS					
REPLACE WITH ENERGY EFFICIENT AT 15 YEAR					
Asset Age	O&M	Utilities	Non-Annual Recurring Maintenance Description	Cost	
1	\$40,000	\$75,000			
2	\$41,200	\$76,500			
3	\$42,440	\$78,030			
4	\$43,710	\$79,590			
5	\$45,020	\$81,180			
6	\$46,370	\$82,800			
7	\$47,760	\$84,460			
8	\$49,190	\$86,150	Replace Blower Motor	\$50,000	
9	\$50,670	\$87,870			
10	\$52,190	\$89,630			
11	\$53,760	\$91,420			
12	\$55,370	\$93,250			
13	\$57,030	\$95,120			
14	\$58,740	\$97,020	Replace with New High Efficiency Unit	\$400,000	
15	\$40,000	\$70,000			
16	\$41,200	\$71,400			
17	\$42,440	\$72,830			
18	\$43,710	\$74,290			
19	\$45,020	\$75,780			
20	\$46,370	\$77,300			
21	\$47,760	\$78,850			
22	\$49,190	\$80,430	Replace Blower Motor	\$50,000	
23	\$50,670	\$82,040			
24	\$52,190	\$83,680			
25	\$53,760	\$85,350			
26	\$55,370	\$87,060			
27	\$57,030	\$88,800			
28	\$58,740	\$90,580			
29	\$60,500	\$92,390			
30	\$62,320	\$94,240			
	\$1,489,720	\$2,503,040	TOTAL 30 YEAR COST	\$500,000	\$4,492,760

30 YEAR LIFE CYCLE COST OF PACKAGE ROOF TOP UNITS					
REPAIRS AND MAINTENANCE ONLY					
Asset Age	O&M	Utilities	Non-Annual Recurring Maintenance Description	Cost	
1	\$40,000	\$75,000			
2	\$41,200	\$76,500			
3	\$42,440	\$78,030			
4	\$43,710	\$79,590			
5	\$45,020	\$81,180			
6	\$46,370	\$82,800			
7	\$47,760	\$84,460			
8	\$49,190	\$86,990	Replace Blower Motors	\$50,000	
9	\$50,670	\$89,600			
10	\$52,190	\$92,290			
11	\$53,760	\$95,060			
12	\$55,370	\$97,910			
13	\$57,030	\$100,850			
14	\$58,740	\$103,880			
15	\$61,090	\$108,040	Replace Coils, Fans & Misc.	\$200,000	
16	\$63,530	\$112,360			
17	\$66,070	\$116,850	Replace Blower Motors	\$50,000	
18	\$68,710	\$121,520			
19	\$71,460	\$126,380			
20	\$74,320	\$131,440	Replace Heat Exchangers	\$150,000	
21	\$77,290	\$136,700	Misc. Metal Repair	\$75,000	
22	\$80,380	\$142,170			
23	\$83,600	\$147,860			
24	\$86,940	\$153,770			
25	\$91,290	\$161,460	Replace Blower Motor	\$50,000	
26	\$95,850	\$169,530			
27	\$100,640	\$178,010			
28	\$105,670	\$186,910			
29	\$110,950	\$196,260			
30	\$116,500	\$206,070			
	\$2,037,740	\$3,619,470	TOTAL 30 YEAR COST	\$575,000	\$6,232,210

Source: Kohnen-Starkey, Inc., June 2011.

Prepared by: Kohnen-Starkey, Inc., June 2011.

Additional analysis criteria may include:

- Type of use and hours of operation
- Operating environment
- Remaining service life (residual or salvage value/cost)
- Inflation and discounting

Additional criteria used in a BCA beyond direct cost savings include:

- Efficiency increases, typically associated with staff savings
- Other quantifiable outputs, such as amount of excess electricity generated from renewable energy sources or increased sales from non-aeronautical sources
- Indirect or non-quantifiable revenue resulting from terminal development, such as increased parking or rental car revenues or increased fuel sales
- Non-quantifiable outputs, such as improved working conditions or passenger experience, or reduced impacts on the environment

A common period of time is used in LCCAs to assess cost differences among alternatives so that costs can be fairly compared. The analysis period should be long enough to include at least two major refurbishments (rehabilitations); however, the number or cycle of major refurbishments between competing alternatives does not have to be the same within the analysis period.

As the service life of one or more options could exceed the analysis period, the concept of remaining service life is considered in an LCCA. When conducting an LCCA, the residual value of an improvement when its service life extends beyond the analysis period should be considered. This extended service life is typically calculated based on project cost and the percentage of service life remaining at the end of the analysis period. Similarly, when an option's service life ends within the analysis period, the salvage value/cost—typically the net value from the recycling of materials at the end of a facility's service life—should be considered.

LCCAs rely on the concept of the time value of money or present value (PV), also known as present worth. For an LCCA, costs that occur at different times over the course of the analysis period must be converted to a common point in time to allow a fair comparison of costs between competing options. In calculating PV, initial and future dollar expenditures are converted to a single point in time, usually the present, or the time of the first cost outlay. In the most simplistic form of analyzing results from an LCCA, PV costs for competing options would be compared to determine the option with the lowest PV. In most LCCAs using fixed, discrete values for LCCA input variables, sensitivity analysis is important to identify areas in which the analysis may be subject to uncertainties. Sensitivity analysis is important in determining a most likely scenario. Optimally, the "best" option will have the lowest PV in the most likely "what if" situations.

Gap Analysis

Gap analysis is used to describe the type of terminal facility that would be needed to reach the desired operational capabilities and service levels described in the airport Strategic Plan. A gap analysis compares the airport's terminal facility inventory to what would be needed to achieve the airport operator's strategic goals.

The principal steps involved in conducting a gap analysis include:

- Gathering and understanding current terminal performance statistics
 - Refer to level of service benchmarks
- Establishing planning parameters, priorities, and expectations

- Deriving terminal facility requirements for:
 - Functional terminal spaces
 - Commercial program spaces
 - Terminal building utilities, architectural, engineering, and special systems infrastructure

Terminal Performance Statistics

Terminal performance statistics inform the analysis by providing information on the performance of existing terminal facilities, airport user characteristics, and customer satisfaction with airport facilities and services, including concessions. This information is typically derived from airport user surveys. Airport operators should refer to *ACRP Report 26: Guidebook for Conducting Airport User Surveys*, 2009, for guidance.

Planning Parameters, Priorities, and Expectations

As part of the gap analysis, factors that contribute to the analysis of terminal facility requirements are discussed and established within the context of the airport's Strategic Plan. These factors may include:

- Activity levels
- Target customer and operational levels of service
- Passenger and airline operational considerations
- Development compatibility

Discussions among airport stakeholders should address desired capabilities, related mission, strategic issues, and long-term objectives. For example:

- Meeting customer service level expectations
- Operating in a changing airline industry
- Addressing unfunded or underfunded mandates
- Identifying additional financial resources and revenue generating opportunities

Airport operators should reference *ACRP Report 25: Airport Passenger Terminal Planning and Design: Vol. 1: Guidebook* and *Vol. 2: Spreadsheet Models and User's Guide*, 2010, for guidance on considerations influencing terminal planning.

Terminal Facility Requirements

After determining the terminal's functional deficiencies, facility requirements can be calculated based on existing and forecast activity levels. Different approaches can be used to develop terminal facility requirements that will be used to generate options for renewing or replacing existing terminal facilities, as discussed below.

Passenger Processors and Airline Operational Space

Passenger processing facility requirements should be developed using methodologies that are generally consistent with the International Air Transport Association (IATA) *Airport Development Reference Manual*, 9th (current) edition and *ACRP Report 25: Airport Passenger Terminal Planning and Design: Vol. 1: Guidebook* and *Vol. 2: Spreadsheet Models and User's Guide*. For large- and medium-sized hub airports, computer modeling should be used to synthesize factors that generate demand and correlate demand to facilities required to achieve performance objectives set forth in the Strategic Plan or through discussions with stakeholders.

Published Federal Guidelines and Standards

Preparation of facility requirements should conform to federal guidelines for terminal facilities as published by the U.S. Department of Homeland Security for TSA and CBP facilities.

Concession Programs

Market-based analyses should be conducted to determine supportable concession programs:

- Review existing concession program information through data analyses and operator interviews
- Benchmark current concession program performance at the airport against the performance of comparable airports and market trends

For administrative areas, interviews with appropriate airport staff could be conducted to determine requirements or the area could be represented as a percentage of overall building spaces, as would be the case for terminal building circulation, services, and engineering infrastructure.

Table 7-7 depicts the projected terminal space requirements prepared by City Airport's Planning and Design unit. The table indicates the amount of building area that would be needed to maintain or achieve the desired level of service and operational capabilities to support current passenger levels (6.0 million annual passengers), and similarly at a future activity level (6.6 million annual passengers). Planning and Design staff indicated that impacts resulting from the 17 percent deficiency in the overall terminal space requirement were not uniformly distributed among the individual processing areas of the terminal:

- Security screening checkpoints have only half the amount of queue area needed.
- Improving checked-bag screening capabilities could require bag areas to be doubled from their current size.
- Increasing pedestrian conflicts occur along narrow circulation corridors and the width of several corridor systems is below building code requirements for exiting.
- Concession program areas are 60 percent less than the estimated supportable concession program space based on comparison of sales per square foot per annual enplaned passenger at similar airports, which indicates significant lost sales, as well as limited offerings.

Financial Capacity Analysis

It is important for airport operators to conduct a financial capacity analysis to estimate the resources available to undertake a capital program, or a portion thereof, such as a terminal redevelopment project. While this Guidebook is focused on terminal projects, it is essential that all elements of the overall capital program be included when undertaking the financial analyses. This section describes how the financial capacity analysis assists in aligning terminal requirements with the airport operator's strategic business goals and, specifically under Step 1, the financial conditions for advancing a Terminal Redevelopment Program. The financial capacity analysis is designed to be high level in nature, with subsequent detailed financial analyses performed under Step 3 of the process, described later in Chapter 9.

A financial capacity analysis serves to determine the financial resources available for a capital program, in both the near and long terms, by using specific techniques to evaluate an airport operator's current and projected revenues, funding sources, and financial obligations. A financial capacity analysis generally involves the following:

- Funding availability analysis
- Passenger facility charge (PFC) capacity analysis
- Cash flow analysis
- Borrowing capacity calculation

Funding Availability Analysis

The initial step in a financial capacity analysis is to evaluate all existing and potential funding available from external and internal sources, taking into consideration any and all existing and

Table 7-7**City Airport—Facility Gap Analysis and Requirements**

Function	Function	Existing Inventory (square feet) ¹	Future Terminal Requirements (square feet) ²	
			Current (6.0 million annual passengers)	Planning Year 1 (6.6 million annual passengers)
Ticketing	Queue Area	4,000	3,840	4,224
Security Screening Checkpoints	Screening Area	19,200	24,000	26,400
	Queue Area	3,000	4,500	4,950
	Subtotal (Security Screening)	22,200	28,500	31,350
Checked-Bag Screening (In-Line Explosives Detection System Units)	Explosives Detection System Room	10,000	20,000	20,000
Outbound Bag Cart Staging	Makeup Area	50,000	50,000	50,000
Baggage Claim	Bag Claim Area	25,000	26,400	26,400
Public Spaces	Corridors and Circulation	57,000	70,000	70,000
	Restrooms	4,000	6,000	6,600
	Subtotal (Public Spaces)	61,000	76,000	76,600
Concessions		25,000	40,000	44,000
Holdrooms		39,000	44,000	44,000
Airline Support and Offices		60,000	60,000	60,000
Airport Support and Offices ³		45,000	45,000	45,000
Terminal Infrastructure ⁴		38,000	50,000	50,000
Total		379,200	443,740	451,574

Notes:

¹Existing conditions are based on current terminal areas at the City Airport.

²Future requirements are based on existing or future activity and level of service goals. Methods and techniques for determining requirements in each functional area are those provided in *ACRP Report 25: Volumes 1 and 2*, 2010, or the *IATA Airport Development Reference Manual*, 9th Edition, 2004.

³Airport support and offices space can be based on a percentage of building size.

⁴Terminal Infrastructure includes areas for mechanical, electrical, and plumbing (typically 7 percent of total building space) as well as space occupied by walls and other structural elements (approximately 5 percent of total building space). The total can be based on a percentage of building size.

Source: Ricondo & Associates, Inc., September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

future commitments of these funding sources. A funding availability analysis considers federal, state, and local grants currently awarded to the airport, as well as grants that could become available, and if those future grants would be for a specific project, such as a terminal renewal or replacement. Federal funds can be provided as:

- FAA AIP entitlement grants
- Letter of Intent (LOI) FAA AIP discretionary grants
- FAA AIP non-LOI discretionary grants

Federal and state grants may be subject to specific eligibility limitations based on the type of grants. Other funding sources that should be considered in the analysis include an airport operator's uncommitted discretionary cash on hand, PFC revenues, any third-party funding sources, and, if applicable, customer facility charge (CFC) revenues that could be applied to potential rental car portions of a terminal project.

In general, the ability of the airport operator to secure funds outside of airport revenues allows for greater financial capacity. While eligibility restrictions on some federal, state, and local funds may affect their use, these funds make up a portion of the overall financial capacity of the airport. Table 7-8 presents a funding availability analysis for the City Airport. A typical funding availability analysis is conducted by evaluating the funding sources discussed below individually.

The selection of an appropriate projection period for the purposes of a financial analysis typically depends upon when the projects are expected to be operational and the length of the project implementation or construction period, including its specific phasing schedule. In most cases, it is generally beneficial to present data for 2 or 3 years beyond when the full capital program is expected to be operational to get an idea of the airport operator's financial performance once all projects are in service. For the City Airport example, a projection period of 10 years was selected (as presented in Table 7-8), which provides 2 full years of financial results after the terminal development options are scheduled to be operational in projected Year 8. However, in many cases, financial models can also extend many years into the future to analyze financial results coterminous with planned issuances of bonds, which may have terms of 25 to 30 years. However, it should be recognized, as with any forecast or projection, that the accuracy of results generally decreases the further out into the future the analysis period extends.

FAA AIP Entitlement Grants

AIP entitlement grants are distributed by the FAA to airports that are part of the National Plan of Integrated Airport Systems (NPIAS). AIP entitlement grants are typically distributed on an annual basis to airport operators based on certain formulae established by the FAA. To be eligible for AIP entitlement grants, an airport must have a justified need for capital improvement projects. If an airport operator is eligible to receive AIP entitlement grants, a funding availability analysis should be conducted to first evaluate the justification to continue collecting the grants based on the airport operator's CIP. If certain CIP projects demonstrate a continuing need for entitlement grants, then the current collections together with the passenger activity forecasts will be used to project future entitlement grant levels. AIP entitlement grants are distributed based on a statutory formula, which is subject to change by the U.S. Congress and based on enplaned passengers and adjusted based on PFC collections, calculated as follows:

- First 50,000 enplaned passengers—\$7.80 per enplaned passenger
- Second 50,000 enplaned passengers—\$5.20 per enplaned passenger
- Next 400,000 enplaned passengers—\$2.60 per enplaned passenger
- Next 500,000 enplaned passengers—\$0.65 per enplaned passenger
- Remaining enplaned passengers—\$0.50 per enplaned passenger
- PFC collection adjustment—Large- and medium-hub airports at which a PFC is collected at \$4.50 per eligible enplaned passenger are eligible to receive a reduced amount of entitlement grants than they would if they charged a \$3.00 PFC (e.g., 25 percent of the calculated maximum entitlement grant).

The FAA does not guarantee the maximum level of entitlements, so the airport operator must evaluate its current entitlement grants to accurately project future receipts. For example, a conservative funding analysis, assuming future CIP projects will be undertaken, holds the entitlement level constant through the projection period. Once the entitlement projection has

Table 7-8

City Airport—Funding Availability Analysis

	Beginning Balance	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
FAA Entitlement Grants (Including Cargo)											
Awarded Entitlements	\$0	\$1,524,500	\$1,541,750	\$1,559,500	\$1,577,500	\$1,596,000	\$1,614,750	\$1,634,000	\$1,653,750	\$1,673,750	\$1,694,500
Expended or Committed Entitlements	0	1,524,500	1,541,750	1,559,500	1,577,500	1,596,000	1,614,750	1,634,000	1,653,750	1,673,750	1,694,500
Available FAA Entitlement Grants	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
FAA Discretionary Grants											
Awarded	\$0	\$0	\$0	\$4,800,000	\$4,900,000	\$3,200,000	\$5,200,000	\$5,400,000	\$3,500,000	\$0	\$0
Expended or Committed	0	0	0	0	0	0	0	0	0	0	0
Available FAA Discretionary Grants	\$0	\$0	\$0	\$4,800,000	\$4,900,000	\$3,200,000	\$5,200,000	\$5,400,000	\$3,500,000	\$0	\$0
State Grants											
Awarded	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Expended or Committed	0	0	0	0	0	0	0	0	0	0	0
Available State Grant Funds	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Local Grants											
Awarded	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Expended or Committed	0	0	0	0	0	0	0	0	0	0	0
Available Local Grant Funds	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Local Cash and Other Funds											
Local Cash on Hand	\$50,000,000	\$51,507,500	\$52,992,000	\$54,453,350	\$55,891,670	\$57,306,852	\$60,699,061	\$64,068,240	\$66,782,745	\$69,369,414	\$71,824,072
Deposited Cash	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	3,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
Committed Local Cash	492,500	515,500	538,650	561,680	584,818	607,790	630,821	1,285,495	1,413,330	1,545,343	1,681,166
Other Funding Sources	0	0	0	0	0	0	0	0	0	0	0
Expended or Committed Other Sources	0	0	0	0	0	0	0	0	0	0	0
Available Local Cash and Other Funds	\$49,507,500	\$50,992,000	\$52,453,350	\$53,891,670	\$55,306,852	\$56,699,061	\$60,068,240	\$62,782,745	\$65,369,414	\$67,824,072	\$70,142,906
Total Available Funding	\$49,507,500	\$50,992,000	\$52,453,350	\$53,891,670	\$55,306,852	\$56,699,061	\$60,068,240	\$62,782,745	\$65,369,414	\$67,824,072	\$70,142,906

Source: Ricondo & Associates, Inc., September 2011.
 Prepared by: Ricondo & Associates, Inc., September 2011.

been established, the annual expenditure of these funds is then evaluated using CIP cash flows. Funds collected, and projected to be collected but not yet committed, are carried forward in the analysis as available funds.

FAA AIP Discretionary Grants

The FAA also provides discretionary grant funding for eligible capital projects. These grants can be one-time awards or multiyear LOI grants with amounts distributed according to an annual payout schedule. FAA discretionary grants are typically provided in the form of reimbursements for funds already expended on a project. If an interim funding source is used initially, the FAA discretionary grants can be used to reimburse that funding source, or the receipts can be applied to other purposes if the initial funding source does not require reimbursement. In the funding availability analysis, the amount of discretionary grants already received by the airport operator is considered, as well as future grants committed by the FAA through an LOI and opportunities for future grant awards. If upcoming CIP projects are eligible for FAA discretionary grants that have not yet been applied for, then the analysis can project future grant awards for those projects. After the FAA discretionary grant receipts have been projected, the annual expenditures of those funds, including reimbursements of interim funding sources, are evaluated. Funds collected, and projected to be collected but not yet committed, are carried forward in the analysis as available funds.

State and Local Grants

Individual airports may have various grant opportunities given their local, regional, and state governments. Grants may be specific to a CIP project or serve a general purpose, such as environmental sustainability. Grants received, as well as projected future grants, will be evaluated against the planned expenditures of the funds, and any funds not yet committed are carried forward in the analysis as available funds.

Local Cash on Hand

The amount of local cash on hand differs by airport based on several factors, such as airport size, levels of nonairline revenue, and airline rate-setting methodology (i.e., compensatory, residual, hybrid). The funding availability analysis accounts for local cash on hand, less the minimum reserve level the airport operator seeks to maintain and the expected or committed future uses of these funds plus the future generation of local cash from continuing operations. Future cash deposits can be determined using a multiyear rates and charges projection model. These models incorporate projected activity, operating expenses, nonairline revenues, and debt service to determine landing and apron fees and terminal rental rates.

Other Funding Sources

Other funding sources unique to an airport, such as CFC revenues, if applicable, or private third-party funding, along with the commitments associated with those funds, should also be incorporated in the financial capacity analysis. The local cash on hand and other funding sources not yet committed can be carried forward in the analysis as available funds.

PFC Capacity Analysis

Because PFCs are generally an integral funding source for most airport terminal projects, an airport operator should consider undertaking a PFC capacity analysis to estimate the potential funds that could be available from this source in the future. In the PFC capacity analysis for the City Airport (Table 7-9) actual and projected PFC collections and expenditures are evaluated to estimate the annual amount of PFC revenues available to be applied directly to future projects or to pay debt service on future PFC bonds. A PFC capacity analysis can be conducted as described in the following paragraphs.

Table 7-9

City Airport—PFC Capacity Analysis

	Beginning Balance	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Beginning PFC Balance	\$34,000,000										
Enplaned Passengers		3,000,000	3,067,500	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,666,000
Calculation of PFCs											
PFC-Eligible Enplaned Passengers	4%	2,820,000	2,883,450	2,948,780	3,015,520	3,083,200	3,152,760	3,223,260	3,295,640	3,369,900	3,446,040
PFC Collection Level		\$4.50	\$4.50	\$4.50	\$4.50	\$4.50	\$4.50	\$4.50	\$4.50	\$4.50	\$4.50
Less: Administrative Fee		(\$0.11)	(\$0.11)	(\$0.11)	(\$0.11)	(\$0.11)	(\$0.11)	(\$0.11)	(\$0.11)	(\$0.11)	(\$0.11)
Effective Rate		\$4.39	\$4.39	\$4.39	\$4.39	\$4.39	\$4.39	\$4.39	\$4.39	\$4.39	\$4.39
Total PFC Collections		\$12,379,800	\$12,658,346	\$12,945,144	\$13,238,133	\$13,535,248	\$13,840,616	\$14,150,111	\$14,467,860	\$14,793,861	\$15,128,116
LESS: Committed PFCs											
PFC Bond Debt Service		\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
PFC Double-Barrel Bond Debt Service		0	0	0	0	0	0	0	0	0	0
PFC Pay-As-You-Go		2,080,000	2,163,200	2,249,728	2,339,717	2,433,306	2,530,638	2,000,000	2,000,000	2,000,000	2,000,000
Plus: Investment Earnings		\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000
PFC's Available for Future Projects		\$34,000,000	\$11,495,146	\$11,695,416	\$11,898,416	\$12,101,942	\$12,309,978	\$13,150,111	\$13,467,860	\$13,793,861	\$14,128,116

Source: Ricondo & Associates, Inc., September 2011.
Prepared by: Ricondo & Associates, Inc., September 2011.

Determining the Beginning PFC Balance

The beginning PFC balance is the amount of PFCs on hand at the time of the analysis. This balance generally consists of the total amount of PFCs collected to date, less the PFCs previously expended, if any, for approved projects over the course of the airport operator's ongoing PFC program. This amount can generally be calculated quickly from the airport's most recent PFC quarterly report (if available) at the time of the analysis.

Projecting Future PFC Collections

The projection of future PFC collections generally begins with an established enplaned passenger activity forecast. Forecast numbers of enplaned passengers are typically reduced by a factor to calculate the amount of PFC-eligible enplaned passengers. Passengers using airline tickets purchased with frequent flyer miles and other non-revenue tickets, along with passengers traveling on flights operated by an excluded class of carriers, are not subject to a PFC and, therefore, are not included in the analysis. For passengers traveling on an itinerary with multiple connections on a one-way trip, the collection of a PFC is restricted to the first two airports on the itinerary where a PFC is imposed. The percentage of PFC-eligible passengers can vary among airports based on the makeup of the local passenger base and the nature of the airline operations at a particular airport. The percentage of PFC-eligible enplaned passengers is typically calculated by dividing the actual PFC revenues by the total enplaned passengers for the latest year for which such data are available.

The percentage of PFC-eligible enplaned passengers (either the percentage for the most recent year or an average of several years) is applied to the forecast number of enplaned passengers to estimate the number of annual PFC-eligible enplaned passengers at the airport. This figure is multiplied by the PFC collection level in effect at the airport (typically, \$3.00, \$4.00, or \$4.50 per eligible enplaned passenger). The PFC collection levels depend on the PFC-eligible projects undertaken, the preference of the airport operator, and approval from the FAA. Finally, this gross amount is reduced by subtracting the standard \$0.11 per passenger administrative fee allowed to the airlines for collecting and remitting PFCs to estimate an airport's annual net PFC collections.

As shown in Table 7-9, investment earnings generated from the collected but unspent PFC balance held by an airport enterprise are also incorporated into the analysis. Investment earnings assumptions should be conservatively estimated based on current market conditions and historical earnings. The sum of the projected annual net PFC collections and projected annual PFC investment earnings equals total annual PFC collections.

Projecting Future PFC Expenditures

Annual projected PFC collections less annual projected PFC expenditures for the current CIP provide the amount of PFC revenues available for future projects. Projected PFC expenditures included in the capacity analysis generally fall into two main categories:

- **Existing and Planned PFC Debt Service**—PFC revenues expended to pay debt service and coverage on existing or planned PFC bonds or other general airport revenue bond (GARB) debt according to the debt service schedule.
- **Planned PFC Pay-As-You-Go Expenditures**—PFC revenues expended on a pay-as-you-go basis for current and planned capital projects.

As shown in Table 7-9, the beginning PFC balance plus the calculated annual PFC revenues available for future projects represents the total projected amount of PFC revenues available for future eligible capital development. Once the PFC capacity analysis has been completed, the annual available PFC revenues are carried forward to the cash flow analysis.

Cash Flow Analysis

The cash flow analysis is conducted to evaluate projected operating revenues and expenditures, existing and planned debt service, future capital expenditures, and the availability of other funds identified in previous analyses on an annual basis throughout the projection period, as exemplified for the City Airport in Table 7-10. The purpose of the cash flow analysis is to estimate the airport enterprise's annual cash flows and funds available to finance capital development or, in this case, a proposed terminal project. A primary benefit to this level of analysis is being able to consider fluctuations in financial factors from year to year, such as spikes in debt service or one-time impacts on expenses or revenues. The various items generally included in a high-level cash flow analysis are described in the next several paragraphs.

Projected Airline Revenues

The first step in developing the cash flow analysis is to estimate total airline revenues for each year. For the purpose of a high-level analysis, total airline revenues can be simplified and calculated based on a standard financial metric, in this case, airline cost per enplaned passenger or "CPE." When using this metric, total airline revenues are simply calculated by multiplying the number of enplaned passengers in the activity forecast for a given year by the CPE. In Year 1, this metric should be the actual figure for the airport enterprise's current fiscal year.

As shown in Table 7-10, the CPE is set at \$5.00 for Year 1. If desired, this initial CPE can then be increased, for example, by an annual inflation factor. The CPE for the City Airport is increased for inflation at an annual rate of 3 percent through the projection period. In the year the project is scheduled for completion, the CPE should be reevaluated and set to a level that is deemed "reasonable." In the City Airport example, the CPE was assumed to increase in Year 8, the year the project opens, to a level of \$11.40 (or \$9.00 as expressed in current year dollars).

Projected Nonairline Revenues

The revenues received from activities at an airport other than typical airline rates and charges, such as those derived from parking, rental cars, concessions, advertising, and other nonairline activities, differ among airports based primarily on their operating characteristics and contractual agreements with tenants. As a result, future nonairline revenue projections should be specific to the revenue source. Parking and rental car revenues, for example, generally correspond to the level of origin-destination (O&D) passengers at an airport, while concessions revenue is a factor of total passenger activity (i.e., also including connecting passenger activity if applicable). Projections of each category of nonairline revenues are generally based on specific assumptions related to the activity forecast, as well as assumptions regarding inflation.

Airport operators generate investment earnings through investing their surplus cash on hand or other required reserves. To the extent that investment earnings are not restricted for other uses, they can also be considered part of an airport operator's revenues.

Projected Annual Operating Expenses

Projected operating expenses, also referred to as O&M expenses, are the costs of operating and maintaining the airport, including the airfield, terminal, landside, and other ancillary facilities. These expenses can be classified into various categories, such as personnel, repairs and maintenance, materials and supplies, utilities, professional services, and other miscellaneous expenses, depending on how the airport operator accounts for them.

Similar to nonairline revenues, projections of operating expenses should be specific to the type of expense. For example, personnel expenses may increase at a higher rate than materials and supplies expenses given increasing costs for employee benefits, such as health insurance and retirement

Table 7-10

City Airport—Cash Flow Analysis

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Enplaned Passenger	3,000,000	3,069,000	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,666,000	3,748,000
Targeted Cost per Enplaned Passenger	\$5.00	\$5.15	\$5.30	\$5.46	\$5.63	\$5.80	\$5.97	\$6.15	\$11.40	\$11.74	\$12.10
Airline Revenues	\$15,800,000	\$15,800,200	\$16,640,217	\$17,527,341	\$18,456,344	\$19,441,026	\$20,472,027	\$21,559,689	\$40,872,337	\$43,049,686	\$45,332,987
Nonairline Revenues	\$33,300,000	\$34,548,750	\$35,844,328	\$37,188,490	\$38,583,059	\$40,029,924	\$41,531,046	\$43,088,460	\$51,409,919	\$53,337,791	\$55,337,959
Investment Earnings	1,309,000	1,359,088	1,409,016	1,461,854	1,516,673	1,573,549	1,632,557	1,693,778	1,757,284	1,823,193	1,891,563
Total Revenues	\$49,609,000	\$51,707,038	\$53,893,560	\$56,177,685	\$58,556,077	\$61,044,498	\$63,635,629	\$66,341,926	\$94,039,550	\$98,210,670	\$102,562,508
Operating Expenses	\$43,500,000	\$45,240,000	\$47,049,600	\$48,931,594	\$50,886,847	\$52,924,401	\$55,041,377	\$57,243,032	\$62,509,391	\$65,009,767	\$67,610,158
O&M Reserve Requirement	435,000	435,000	452,400	470,496	489,316	508,888	529,244	550,414	1,316,590	625,094	650,098
Net Revenues Before Debt Service and Capital Expenditures	\$5,674,000	\$6,032,038	\$6,391,560	\$6,775,605	\$7,179,913	\$7,611,209	\$8,065,008	\$8,548,480	\$30,213,568	\$32,575,809	\$34,302,252
Existing Debt Service to be Paid with Airport Revenues	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000
Estimated Cash to Fund Capital Expenditures	492,500	515,500	538,650	561,680	584,818	607,790	630,821	1,285,495	1,413,330	1,545,343	1,681,166
Estimated Future Debt Service for Other Projects	0	0	0	0	0	0	0	0	0	0	0
Future Debt Service Associated with Terminal Project	0	0	0	0	0	0	0	0	24,800,238	24,800,238	24,800,238
Future Debt Service Coverage (If not Rolling Coverage)	0	0	0	0	0	0	0	0	0	0	0
Excess Revenues Available for Future Projects	\$1,181,500	\$1,516,538	\$1,852,910	\$2,213,925	\$2,595,085	\$3,003,418	\$3,434,187	\$3,262,985	\$0	\$2,230,228	\$3,820,849
PFC Revenues	\$47,316,615	\$13,396,211	\$13,347,549	\$13,646,230	\$13,952,495	\$14,267,261	\$14,586,324	\$14,913,854	\$15,249,893	\$15,594,442	\$15,943,289
Less:											
Existing Debt Service to be Paid with PFCs	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Estimated PFC Pay-As-You-Go for Other Projects	2,000,000	2,080,000	2,163,200	2,248,728	2,338,717	2,433,306	2,530,636	2,000,000	2,000,000	2,000,000	2,000,000
Future PFC Debt Service Associated with Terminal Project	0	0	0	10,396,502	10,396,502	10,396,502	10,396,502	10,396,502	10,396,502	10,396,502	10,396,502
Future PFC Debt Service Coverage (If not Rolling Coverage)	0	0	0	0	0	0	0	0	0	0	0
Excess PFCs Available for Future Projects	\$44,316,615	\$10,316,211	\$10,184,449	\$0	\$216,275	\$437,453	\$659,183	\$1,517,352	\$1,853,391	\$2,197,940	\$2,546,787
Other Available Funds											
FAA Entitlement Grants	\$1,507,500	\$1,524,500	\$1,541,750	\$1,559,500	\$1,577,500	\$1,596,000	\$1,614,750	\$1,634,000	\$1,653,750	\$1,674,000	\$1,694,500
FAA Discretionary Grants	0	0	0	5,700,000	5,850,000	6,075,000	6,225,000	0	0	0	0
State Grants	0	0	0	0	0	0	0	0	0	0	0
Local Grants	0	0	0	0	0	0	0	0	0	0	0
Local Cash	3,492,500	7,166,250	7,557,225	16,622,270	8,665,977	3,709,686	6,049,564	6,745,243	6,946,870	6,654,889	6,766,998
Total Other Available Funds	\$5,000,000	\$8,690,750	\$9,098,975	\$23,881,770	\$16,093,477	\$11,380,686	\$13,885,314	\$6,379,243	\$8,600,620	\$8,328,889	\$8,463,498
Total Other Available Funds Including PFCs	\$49,316,615	\$19,006,961	\$19,283,424	\$23,881,770	\$16,309,753	\$11,818,138	\$14,548,497	\$9,896,595	\$10,454,012	\$10,526,829	\$11,010,285
Total Annual Funds Available for Future Projects	\$50,498,115	\$20,523,499	\$21,136,335	\$26,085,695	\$18,904,848	\$14,821,556	\$17,982,684	\$13,159,580	\$10,454,012	\$12,757,057	\$14,831,133
Cumulative Total	\$50,498,115	\$71,021,614	\$92,157,948	\$118,253,644	\$137,156,492	\$151,980,048	\$169,962,732	\$183,122,311	\$193,576,323	\$206,333,381	\$221,164,514

Source: Ricondo & Associates, Inc., September 2011.
Prepared by: Ricondo & Associates, Inc., September 2011.

obligations. Therefore, it is important to understand an airport operator's historical operating expenses and contractual obligations to develop useful projections of future operating expenses.

Estimates of incremental operating expenses associated with ongoing or anticipated CIP projects should also be considered in any projection of operating expenses as the projects become operational. For example, if terminal capacity or the square footage of the building footprint is being increased, additional operating and maintenance needs may arise compared with current levels. However, newer facilities may also be more energy efficient, which could result in a decrease in operating expenses. It is important to consider these types of elements.

If an airport operator has outstanding revenue bonds, it may also be required to maintain an O&M reserve fund as part of its obligations to its bondholders. These fund requirements are generally sized to hold cash equal to 2 to 3 months of annual operating expenses. Operating expenses, along with any O&M reserve fund requirements, are typically subtracted from annual airport revenues in the cash flow analysis.

Existing and Planned Debt Service

Existing and any upcoming or planned debt service payments from airport revenues should also be included in the cash flow analysis, as shown in Table 7-10. Such payments primarily include GARB debt service, including an allowance to maintain compliance with any rate covenant or debt service coverage requirement. These line items presented on Table 7-10 include existing debt service from previously issued bonds as well as estimated debt service from planned bond issuances associated with CIP projects outside of the terminal project.

Capital Expenditures

The cash flow analysis should also include airport revenues projected to be expended on capital projects other than the terminal project on a pay-as-you go basis, as presented in Table 7-10.

Projected PFC Revenues

PFC revenues are generally included in the cash flow analysis from a prior PFC capacity analysis. The amount of PFC revenues available to fund a future project equals projected annual PFC revenue less the annual amount of PFC revenues used for current and expected capital projects and debt service outside of the proposed terminal project.

Total Annual Funds Available for Future Projects

As shown in Table 7-10, total annual airport revenues less operating expenses, the O&M reserve requirement, existing and planned debt service, and other capital expenditures and obligations generally equal excess revenues available for future projects. All other available funds from the funding availability and PFC capacity analyses can then be added to the excess revenues available for future projects to equal the total annual funds available for future projects. In most cases, the funds available to an airport operator to implement a large project, such as major terminal replacement or renewal, are not sufficient to meet the significant cash flow needs of the project. As such, some form of borrowing or debt will be required to undertake the project. At this point, the borrowing capacity of the airport operator can be calculated in accordance with available general revenues.

Borrowing Capacity Calculation

A borrowing capacity calculation can be undertaken in several ways. Table 7-11 presents a version of such a calculation using the City Airport example. From the cash flow analysis discussed above, the project was assumed to be fully operational in Year 8. At that point in time, the airport

Table 7-11
Borrowing Capacity Calculation

	Escalated Dollars
Net Revenues Available for Future Debt Service	\$24,800,238
Amortization Factor	0.0782
Debt Capacity	\$317,030,277
Less:	
Capitalized Interest	\$47,554,542
Bond Issuance Fees	6,340,606
Debt Service Reserve	24,800,238
Debt Service Coverage (if Rolling Coverage)	6,200,060
Net GARB Proceeds Available for Future Project Costs	\$232,134,832
PFC Borrowing Capacity:	
PFC Revenues Available for Debt Service	\$10,396,502
Amortization Factor	0.0746
PFC Borrowing Capacity	\$139,358,000
Less:	
Bond Issuance Fees	\$2,787,160
Debt Service Reserve	10,396,502
Net PFC Bond Proceeds Available for Project Costs	\$126,174,338
Total Bond Proceeds Available for Project Costs	\$358,309,170

Source: Ricondo & Associates, Inc., September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

operator would be able to charge applicable capital and operating expenses associated with the project to the users. Therefore, the net revenues available for debt service in Year 8 are the starting point of the borrowing capacity calculation, as described below.

The PFC borrowing capacity calculation is also presented in Table 7-11. The PFC borrowing capacity analysis generally follows the same process as the airport revenue bond borrowing capacity calculation described below. However, one difference from GARB debt is that PFC revenue can be applied toward debt service before the asset is placed in service, thus eliminating the need to issue additional debt as a carrying cost through the construction period (i.e., capitalized interest). Capitalized interest is generally required when an airport operator issues GARB debt, as users or the airlines cannot be charged for the project until it is placed in service. As shown in Table 7-10, the amount of excess PFC revenues for the City Airport in Year 3 was calculated to equal zero as PFCs begin to pay debt service for the terminal project.

The total project costs supported by the airport operator's general revenues plus PFC borrowing capacity for the City Airport example are approximately \$358.3 million in escalated dollars, as presented in Table 7-11. A further description of the various elements included in this analysis is provided below.

Net Revenues Available for Future Debt Service

Net revenues available for future debt service are calculated in the cash flow analysis using a targeted figure for total airline revenues and projections of nonairline revenues, operating expenses, existing and planned debt service, other capital expenditures, and other available

funds. The net revenues available for debt service in the cash flow analysis for the first year the project is open and when debt service is projected to commence serve as the basis for calculating the airport enterprise's borrowing capacity. As shown in Table 7-11, the net revenues available for future debt service reflect the calculated future debt service capacity in Year 8 of the cash flow analysis presented in Table 7-10.

Amortization Factor

The amount of net revenues available for future debt service is the annual debt service the airport enterprise will be able to pay on bonds associated with the future terminal project. That amount is then divided by a coverage factor (e.g., 1.25) to determine the maximum annual debt service payment required and the associated allowance for coverage. The debt service payment is then divided by an amortization factor. The amortization factor is a ratio that can be used to calculate what the total debt requirement is based on annual amounts available. For this type of analysis, a 30-year amortization period is typically assumed, less the number of years of capitalized interest at the current market interest rate.

Borrowing Capacity

Applying the amortization factor to the net revenues available for future debt service yields the total borrowing capacity of the airport enterprise (whether bonds or another debt structure is used). The total borrowing capacity represents the par amount of debt the airport operator may issue, including capitalized interest, the cost to issue the debt, a debt service reserve fund, and another costs to be funded at closing from transaction proceeds. The net proceeds available to fund the project costs are generally considered the par amount of the bonds less the following:

- **Capitalized Interest**—As debt service cannot be included in airline rates and charges until the project is placed in service, the airport operator must borrow an amount equal to the interest due from the time of debt issuance through the project's opening. This interest is referred to as capitalized interest.
- **Cost of Issuance**—Fees associated with the bond transaction, which typically equal approximately 2 percent of the amount of issuance.
- **Debt Service Reserve**—Typically calculated as one year of debt service.

An airport operator may want to consider adjusting the assumptions used in the cash flow analysis, including the targeted CPE, multiple times as such adjustments will provide several calculations of the airport enterprise's borrowing capacity and a range of financing options for management to consider as it moves forward with a planned capital project.

Total Funds Available for Future Terminal Project

The total funds available for a future terminal project can then be determined as the borrowing capacity of the airport enterprise plus the cumulative total of the other available funding sources available on a pay-as-you-go basis through the assumed issuance of the GARBs in Year 8, as presented in Table 7-10, or approximately \$551.9 million (e.g., \$358.3 million + \$193.6 million). In this analysis, these amounts are expressed in nominal or escalated dollars.

As demonstrated, these funding capacity analyses can become quite complex given the nature of the project and the amount of financial information required. To provide the reader some assistance in conducting the analyses, a spreadsheet template for a funding capacity analysis is included in Appendix C of this Guidebook, along with additional instructions for use.

The projected total amount of available funds is affected by forecast activity levels, projected revenues, expenses, debt service, and the targeted CPE. Once the airport operator has calculated

its project funding capacity, it is recommended that various sensitivity analyses be conducted, including the manipulation of key assumptions, to help an airport operator understand how its financial capacity is affected to better understand the risk involved. It is critical that the airport operator fully understand the resources it can afford to invest in a terminal project or other CIP project, and the best strategy for financing the capital program.

Importance of Passenger Activity Forecasting to Financial Analyses

Passenger activity forecasting is a critical element in developing the financial capacity analysis. The activity forecast drives important factors in the financial analysis, including projections of operating and PFC revenues. As deviations from the forecast could have significant ramifications for the future financial performance of the airport, the development of assumptions regarding future passenger activity should be given careful consideration to ensure the accuracy of the financial capacity analysis.

Aggressive Activity Forecasting

An aggressive activity forecast (i.e., a forecast in which a high level of passenger activity is assumed relative to economic conditions or available air service) risks overstating the future numbers of enplaned passengers at an airport. As the projections of operating and PFC revenues are a function of the activity forecast, aggressive assumptions regarding future passenger levels may lead to overestimation of future revenue streams and, thus, the amount of annual funds available to pay future debt service. As the funds available to pay future debt service are carried forward to the borrowing capacity analysis, the borrowing capacity calculation may overestimate the amount of funds available to finance the capital program, including a future terminal project. Because of the nature of the borrowing capacity calculation, a relatively small increase in the annual funds available to pay future debt service yields a much larger increase in potential borrowing capacity. Thus, the use of aggressive assumptions in an activity forecast risks the possibility of overstating the true affordability of a capital program.

Overly Conservative Activity Forecasting

While being conservative (i.e., assuming a low level of passenger activity relative to economic conditions or available air service) generally proves beneficial in activity forecasting from the standpoint of financial analyses, using an overly conservative activity forecast can also misconstrue the financial capacity analysis to the detriment of the airport operator and key stakeholders. Should the activity forecast significantly understate future passenger numbers and, as a result, underestimate projections of future general airport revenue and PFC collections, the financial capacity analysis may yield results that demonstrate a much smaller amount of available funds for future projects than would actually be available, possibly to the point where a feasible project is not undertaken. As such, a conservative yet reasonable/realistic activity forecast is generally considered the preferred approach for financial analyses.

Events Affecting Existing Forecast

If a major event occurs that significantly affects the long-term enplaned passenger levels at the airport, whether positively or negatively, the passenger activity forecast should be reevaluated and the financial capacity reanalyzed to determine the potential effects on the funding available for the capital program. As discussed later, a series of sensitivity analyses or risk analyses is typically recommended to help identify and evaluate the key factors that could alter the airport operator's overall project affordability.

Step 2: Refine Terminal Redevelopment Objectives and Generate Options

The principal goal of Step 2 is to develop terminal concepts that represent reasonable options for terminal renewal or terminal replacement. *ACRP Report 25: Airport Passenger Terminal Planning and Design: Vol. 1: Guidebook and Vol. 2: Spreadsheet Models and User's Guide*, describes the iterative process typically undertaken to refine a terminal program and generate concept options.

Exhibit 8-1 illustrates the typical activities that occur in Step 2. While shown sequentially, the process to refine the terminal program and generate concepts is an iterative process in which results are improved by feedback from stakeholders involved in the Terminal Redevelopment Program.

To achieve the stated goal, several important objectives should be met:

- Refinements to the terminal program must correlate with the airport's Strategic Plan.
- Descriptions of terminal requirements must be unbiased in terms of interpreting or representing the objectives and goals for terminal redevelopment.
- Concept options must reasonably satisfy the terminal program.

Depending on the terminal development program, the concept options may or may not include a status quo (i.e., do nothing) option. In cases in which the program statement identifies mission requirements that are new or unmet, then, for all practical purposes, a status quo (do nothing) option is most likely irrelevant, as the current terminal does not meet the minimum requirements.

The documentation of each concept option should minimally include the following to proceed with subsequent evaluations:

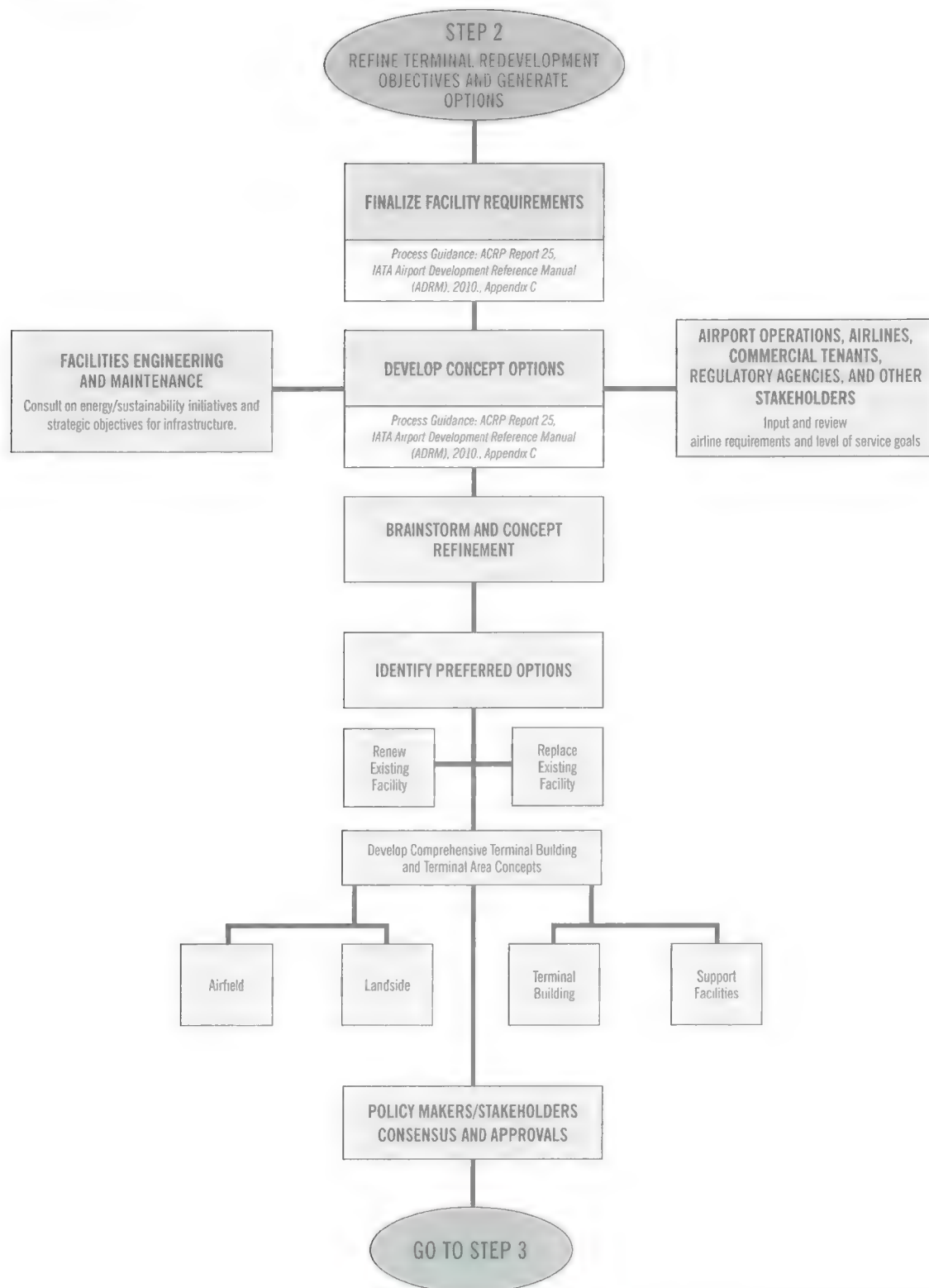
- Drawings of the facility, including the placement of properly sized facilities to house terminal functions
- Illustrated site requirements (addressing phasing issues if the current site is to be used; addressing relocation and phasing issues if a new site is to be used)
- Illustrated phasing requirements at a conceptual level, addressing requirements for relocated functions during construction
- Building area tabulations that correlate to airline rates and charges space categories.

The operator of the City Airport implemented a collaborative Step 2 process involving key stakeholders in brainstorming sessions and regular progress meetings to update participants on the vetting of solutions and synthesis of the most feasible ideas into two concept options depicted in the following exhibits:

- Exhibit 8-2, Exhibit 8-3, and Exhibit 8-4: Renew the existing terminal in place with building expansion to accommodate additional space requirements.
 - Renewal of the existing terminal would require construction of an 8 to 10 gate temporary facility during the phased reconstruction of the landside terminal and two concourses.

Exhibit 8-1

Step 2 Process Diagram

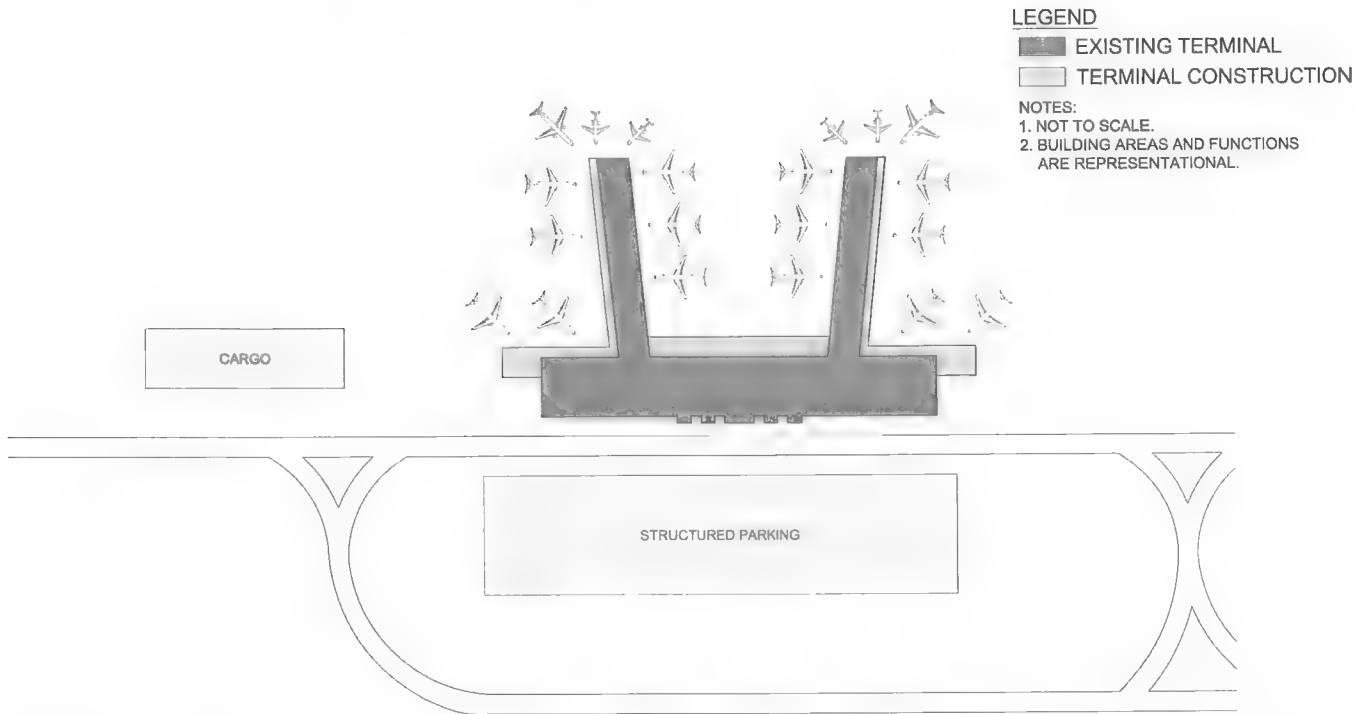


Source: Ricondo & Associates, Inc., June 2011.

Prepared by: Ricondo & Associates, Inc., June 2011.

Exhibit 8-2

City Airport—Renewal Concept Terminal Area Plan



Renew Existing Terminal Option

Expand concourse widths, providing new restrooms and concession areas.

Reconfigure apron and holdroom areas for largest Airplane Design Group (ADG) III aircraft.

Expand upper level area between the concourses for expanded and consolidated security screening checkpoints and concession court.

New lower level space for expanded baggage screening.

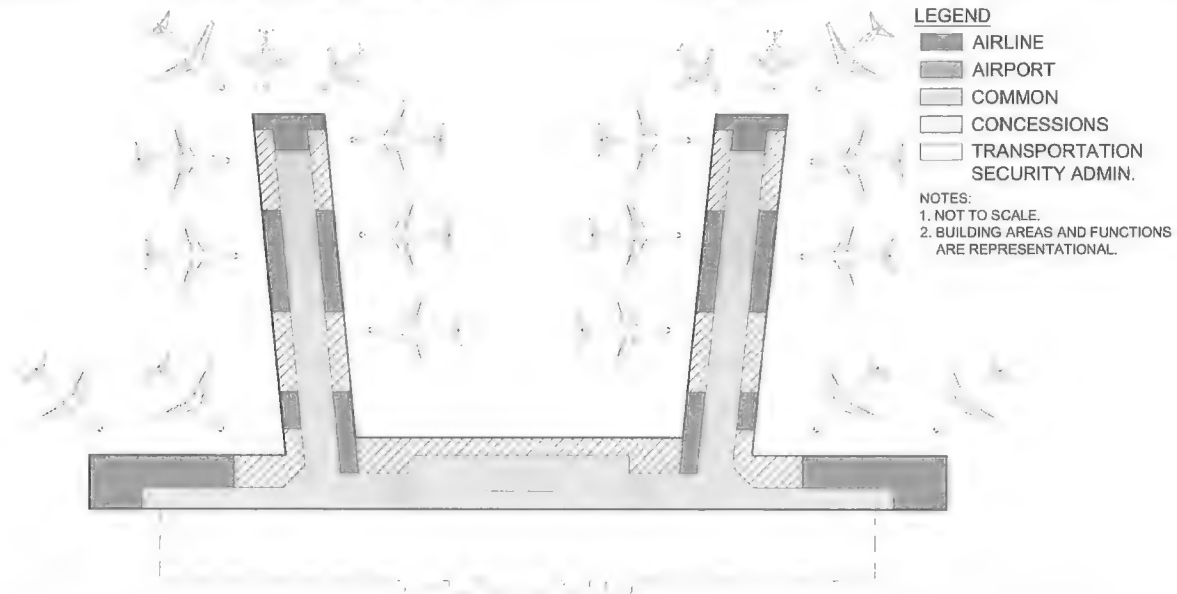
Source: Ricondo & Associates, Inc., June 2011.

Prepared by: Ricondo & Associates, Inc., June 2011.

Exhibit 8-3

City Airport—Renewal Option Terminal Floor Plans

Upper Level Floor Plan



Lower Level Floor Plan

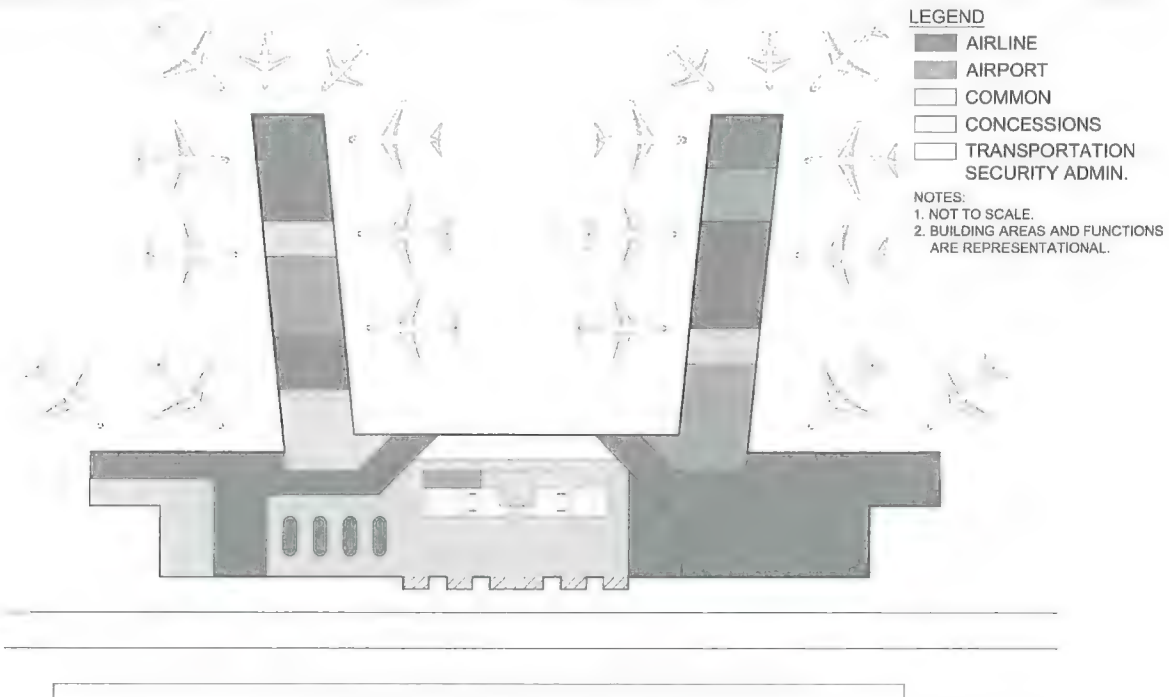
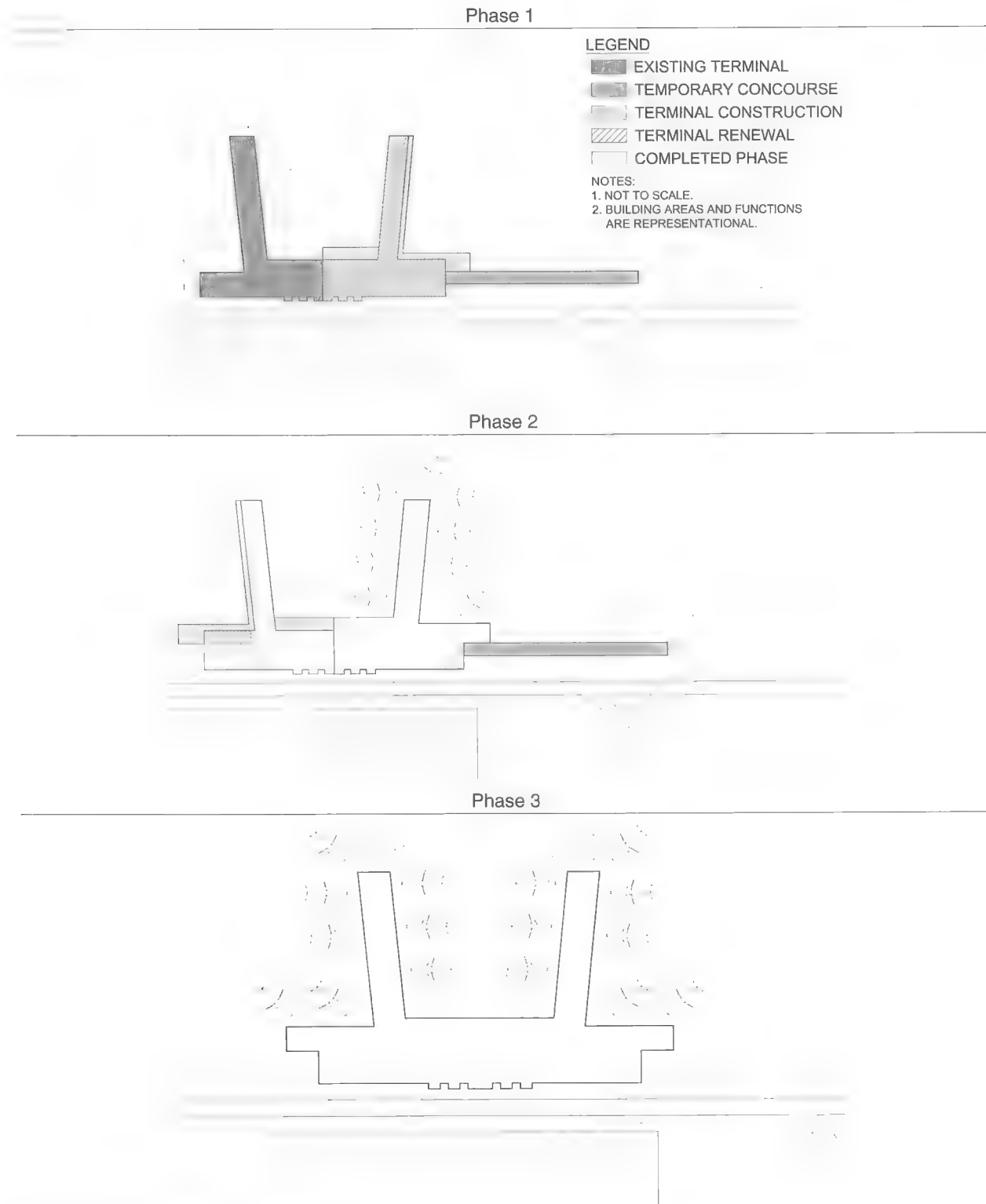


Exhibit 8-4

City Airport—Renewal Concept Phasing

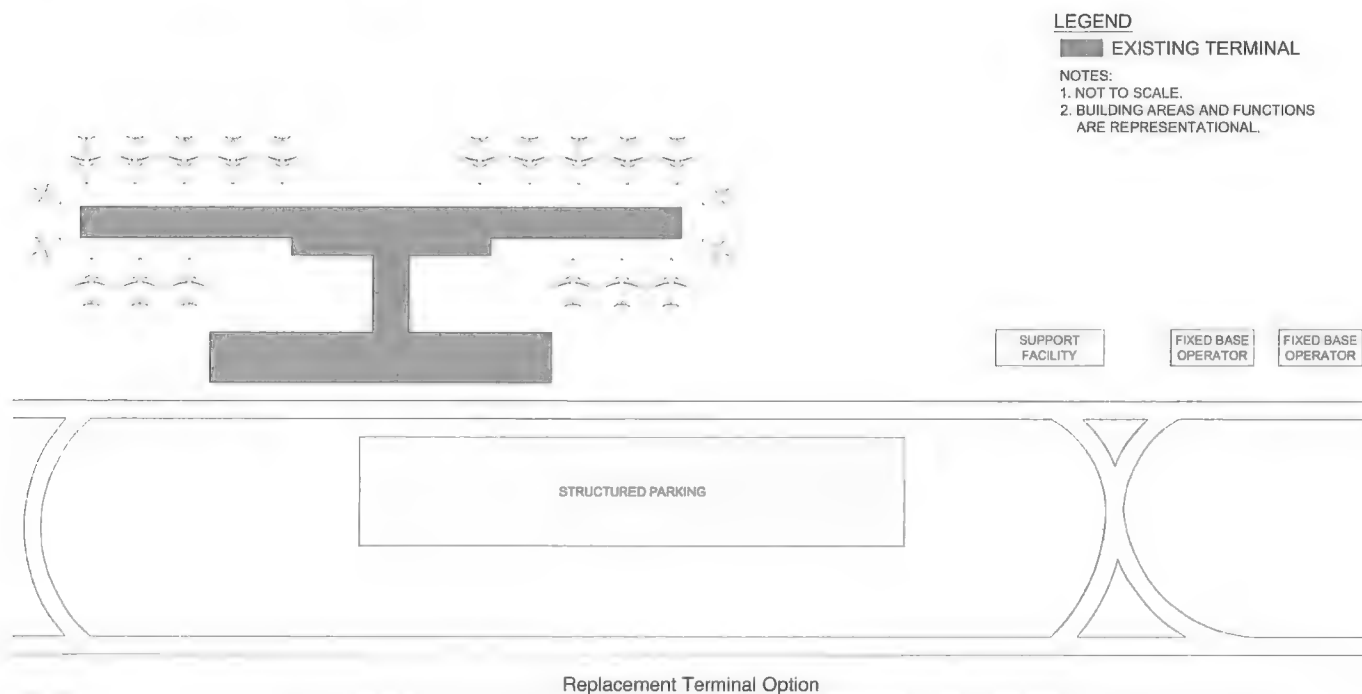


- Exhibit 8-5, Exhibit 8-6, and Exhibit 8-7: Replace the existing terminal with a new facility adjacent to the existing building.
 - The replacement terminal would be constructed relatively close to the existing terminal, necessitating two major construction phases and the phased demolition of the existing terminal and concourses. The site plan conserves terminal area and maximizes the use of the existing terminal roadway network.

In both cases, landside facilities are assumed to be accommodated on a single level; with airside facilities, including passenger screening, post-security concessions, and holdrooms accommodated on a second level. Table 8-1 presents the total terminal space tabulation for each option grouped into space categories that correlate to the rates and charges schedule.

Exhibit 8-5

City Airport—Replacement Concept Terminal Area Plan



Construct new terminal with linear 20 gate concourse sized to accommodate the largest Airplane Design Group (ADG) III aircraft.

Landside portion of terminal would be one level.

Airside portion including concourses, security screening checkpoints, concession court, and circulation between concourses would be two level.

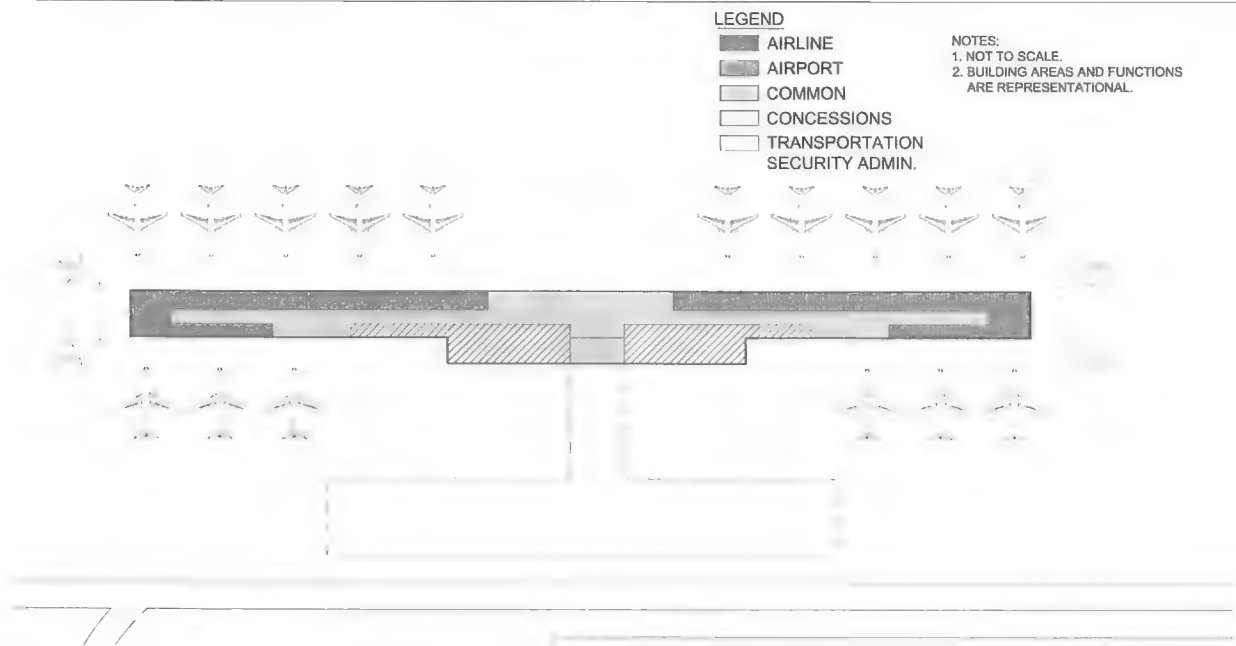
Relocate existing adjacent and conflicting facilities.

Expand roadway to accommodate relocated curbside.

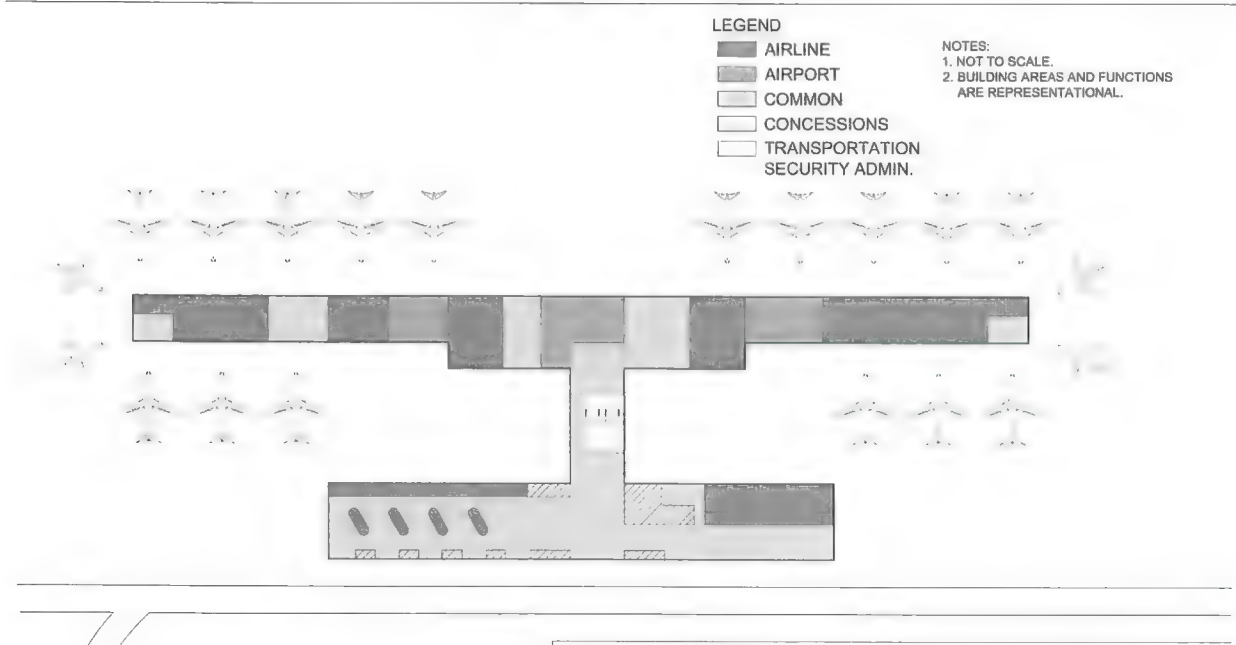
Exhibit 8-6

City Airport—Replacement Option Terminal Floor Plans

Upper Level Floor Plan



Lower Level Floor Plan



Source: Ricondo & Associates, Inc., June 2011.
 Prepared by: Ricondo & Associates, Inc., June 2011.

Exhibit 8-7

City Airport—Replacement Concept Phasing

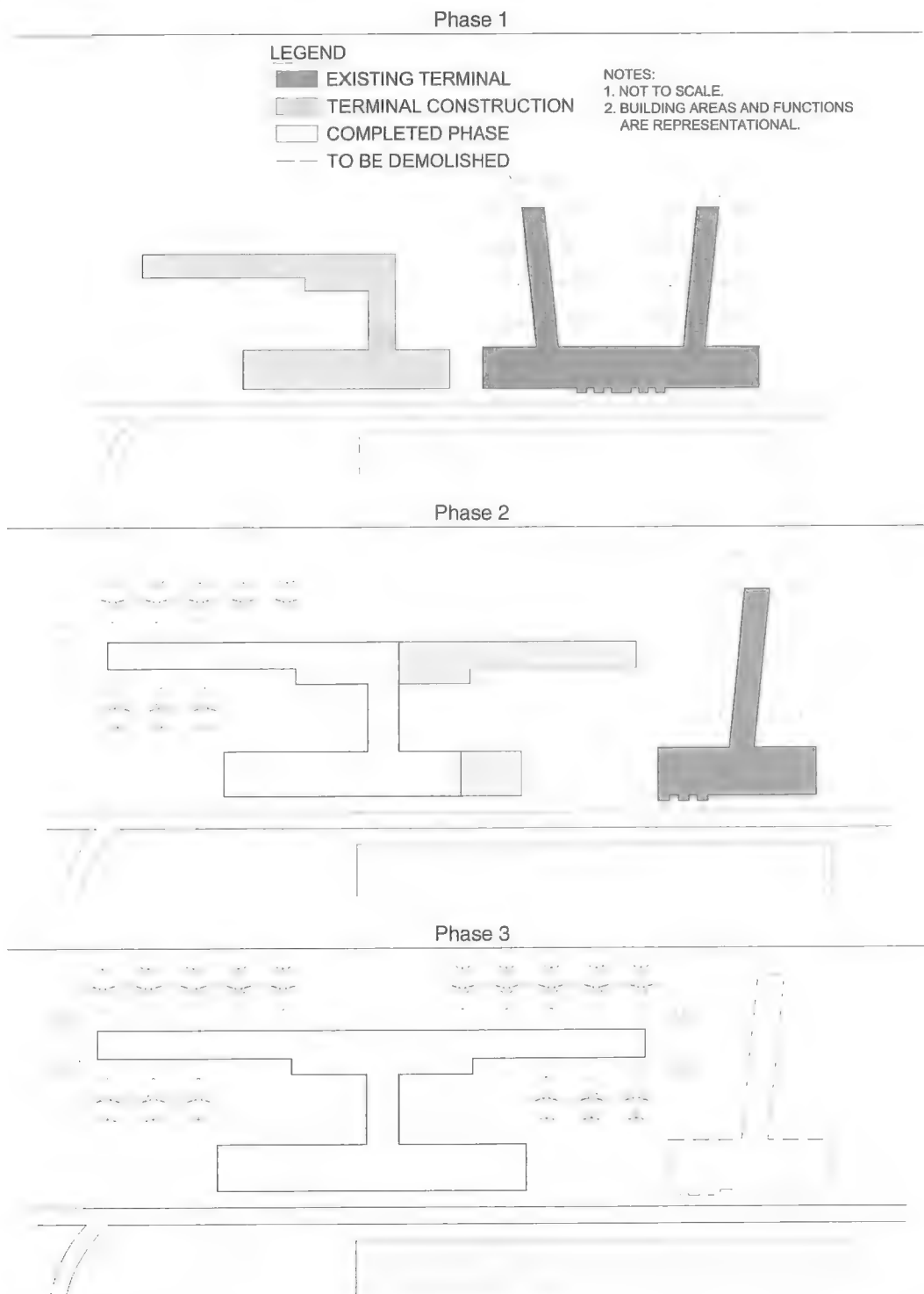


Table 8-1**City Airport—Renewal and Replacement Terminal Floor Area Summary**

	Terminal Space by Component (square feet)			
	Existing Terminal	Options		
		Renewal Option	Replacement Option	
		Net New to Build	Total Area ¹	Total Area
Airline Leased Space:				
Preferential Leased Space				
Ticketing and Offices	15,000	-	15,000	15,000
Holdrooms	29,000	9,000	38,000	35,000
Operations	26,000	1,000	27,000	25,000
Bag Service Offices	4,000	-	4,000	4,000
Subtotal Preferential Leased Space	74,000	10,000	84,000	79,000
Joint Use Space				
Bag Makeup	33,000	2,000	35,000	34,000
Bag Claim	25,000	4,000	29,000	28,000
Tug Drive	17,000	1,000	18,000	15,000
Subtotal Joint Use Space	75,000	7,000	82,000	77,000
Total Airline Leased Space	149,000	17,000	166,000	156,000
Building Space:				
Terminal Rentable Space				
Airline Leased Space	149,000	17,000	166,000	156,000
Nonairline Offices	10,000	-	10,000	13,000
Concessions	25,000	10,000	35,000	45,000
Vacant/Other Airline Space	25,000	3,000	28,000	26,000
Airport Administration	35,000	-	35,000	40,000
Total Terminal Rentable Space	244,000	30,000	274,000	280,000
Public Space	94,000	80,000	174,000	135,000
Total Usable Space	373,000	110,000	483,000	455,000
Mechanical / Electrical / Plumbing / Building Structure Space	38,000	12,000	50,000	36,000
Total Terminal Space	376,000	122,000	498,000	451,000

¹In Option 1, existing structural and functional adjacencies may result in the area needed to accommodate a purpose to exceed the area required in the gap analysis and calculated facility requirements.

Source: Ricondo & Associates, Inc., September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

Step 3: Evaluate Options

The principal goal of Step 3 is to develop qualitative and quantifiable factors to focus the decision makers on the business aspects of their decisions.

- Qualitative evaluations focus on the ability of each concept option to reduce or eliminate gaps in the existing terminal in a manner that best achieves the airport operator's strategic goals.
- Detailed financial analyses address the issues of debt capacity and affordability based on the total life-cycle project costs of each option and related terminal revenue increases.

Exhibit 9-1 illustrates the sequence of analyses under Step 3 and points in the sequence when analyses conducted by different organizational units should be correlated and reviewed with stakeholders or decision makers. The outcomes from Step 3 are:

- First, confirmation that one or both options are fundable.
- Second, if all options are fundable, then additional value and sensitivity analyses should be conducted to select the best option based on business-driven considerations rather than purely on cost.
- In cases in which the option(s) is (are) not within the funding capacity of the airport enterprise, the assumptions used in the model must be revisited or Step 2 should be revisited.

The following delineates the different analyses to be conducted under Step 3.

Qualitative Evaluations

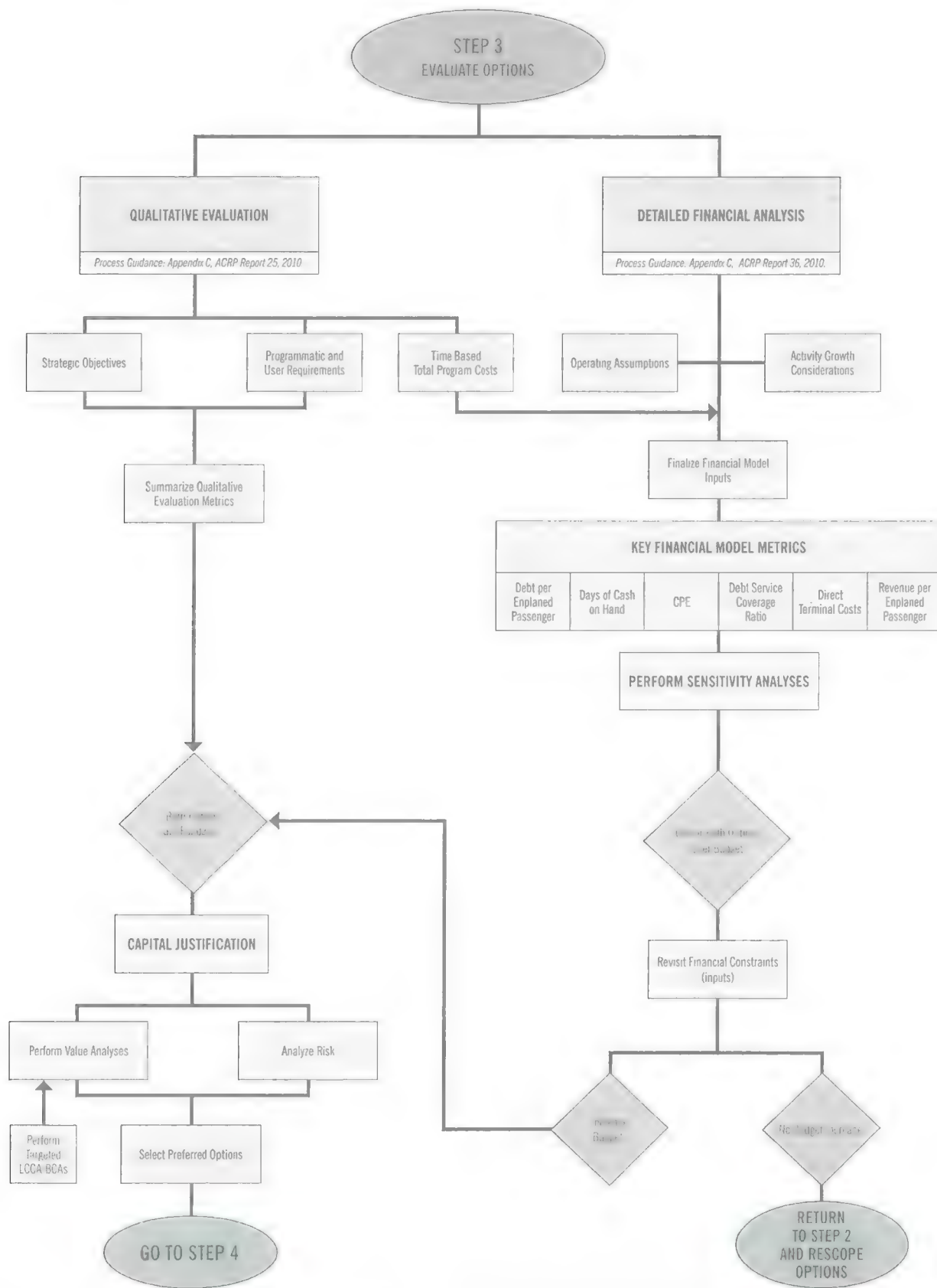
Program Compliance Evaluation

An important objective for generating competing options (Step 2) is that the options must reasonably satisfy the terminal program requirements. However, constraints imposed by existing infrastructure and construction phasing to maintain ongoing operations can result in differences in the size of renewal options compared to the terminal program requirements. Typically, replacement options are more able to conform to a calculated terminal facility space program.

Table 9-1 presents a comparison of the degree to which each terminal option for the City Airport conforms to the stated terminal program. Both options reasonably conform to the stated program, although it should be noted that the renewal concept falls 5,000 square feet short in the concession area, even though the gross area of the renewal concept is 10 percent greater than the gross area of the replacement concept.

Exhibit 9-1

Step 3 Process Diagram



Source: Ricondo & Associates, Inc., June 2011.

Prepared by: Ricondo & Associates, Inc., June 2011.

Table 9-1
City Airport Options—Evaluation of Facility Program Conformance

				Terminal Development Options	
	Unit	Program Target (at 6.0 million annual passengers)	Existing Conditions	Renew	Replace
Terminal Facilities					
Ticketing Counter Positions	Number	60	50	60	60
Self-Service Devices	Number	[in above]	-	[in above]	[in above]
Ticketing Curbside Positions	Number	4	2	4	4
Bag Claim Area	Square Feet	26,400	25,000	29,000	28,000
Bag Claim Frontage	Linear Feet	720	480	720	720
Passenger Security Checkpoints	Number	10	8	10	10
EDS Bag Screening Devices	Number	6	4	6	6
Concessions	Square Feet	40,000	25,000	35,000	45,000
Gate Holdrooms (average size)	Square Feet	2,200	1,950	2,550	2,350
Landside Facilities					
Arrivals Curb	Linear Feet	450	450	450	450
Departures Curb	Linear Feet	450	450	450	450
Commercial Curb	Linear Feet	[in above]	[in above]	[in above]	[in above]

Notes: EDS = Explosives Detection System

Source: Ricondo & Associates, Inc., June 2011.

Prepared by: Ricondo & Associates, Inc., June 2011.

Comparative Performance Evaluation

A comparative Performance Evaluation should be conducted to discern differences between options pertaining to:

- Performance (connect times, baggage travel distances, maintainability)
- Integration with airfield configuration and landside facilities (roads, curbs, parking, ground transportation)
- Experiential (aesthetic opportunities, ease of use, wayfinding)
- Adaptability to sustainability initiatives and other design qualities inherent in an option, which may not be quantifiable, but which helps differentiate among competing options.

Important considerations in the qualitative evaluation of a renewal option are challenges associated with maintaining normal operations during construction. Many aspects of constructing new facilities in an operating terminal environment can be quantified as inputs to the financial analyses, for example, longer construction duration, temporary construction, multiple phase construction, insurance, potential staff additions, and loss of revenue for affected tenants. However, degradation to passenger level of service should be recognized, even if it is difficult to assess the financial implications of impacts such as longer walking distances resulting from construction barricades or tenant dislocations into temporary facilities.

Table 9-2 summarizes the Performance Evaluation of the renewal and replacement options for the City Airport, as conducted by key stakeholders:

- Not surprisingly, the replacement option scored higher (by more than one point) relative to the renewal option in terms of implementation and operations:
 - Implementation—Stakeholders principally acknowledged the operational impacts on existing activities, use of temporary facilities, and risk of service disruption resulting from construction occurring in an operating terminal.
 - Operations—Stakeholders identified that the design of the replacement option required few, if any, compromises to preferred operating practices. Engineering and Maintenance indicated that a replacement terminal could be designed without having to incorporate measures that would be needed in the renewal option to maintain parts of existing systems or create workarounds. Floor-to-floor heights could be increased in the replacement option to improve accessibility to equipment (building utilities and baggage handling systems) for maintenance.
- The renewal option was recognized as being more compatible with existing landside facilities.
- Since the anticipated program costs for both options are within the funding capacity of the airport operator based on the earlier Step 1 financial analysis, participants conducting the qualitative Performance Evaluation deferred any evaluation of comparative costs to the detailed financial analysis concurrently under way.

In preparing a Performance Evaluation, care must be taken to identify and select evaluation measures that reflect or cover the important characteristics of all concepts or options being considered. For example, the performance comparisons in Table 9-2 are generic and could be applied to many types of projects; however, the measures would not necessarily apply in all cases since some projects might require additional measures to provide a thorough evaluation. These should be determined on an individual project basis.

Program Cost Estimates

Program costs should be estimated for each terminal development option. Program costs include new construction, temporary measures (including tenant relocation or dislocation that would not typically be included as part of the contractor's General Conditions), general contractor markups and program soft costs (planning and design, program management, permitting, testing and certifications, and program contingency). Separate estimates of annual O&M, utility, and routine repair costs for each option should be prepared as input to the detailed financial analysis.

The estimated program costs for the City Airport terminal options are summarized in Table 9-3. The estimated cost of each option is lower than the total funds available, calculated to be \$552 million under the Step 1 financial capacity analysis. As indicated in the Step 3 process diagram, further financial analyses should be performed to confirm the airport enterprise's financial capacity and develop additional financial metrics needed by decision makers to select the preferred terminal redevelopment option on the basis of business considerations rather than on the basis of lowest cost alone.

To support the financial analysis, program costs should be grouped into categories that support subsequent cost recovery and funding eligibility analyses. Exhibit 9-2 presents graphs of annual cash outflows related to the capital program costs for the City Airport terminal options over the duration of the construction period to support the financial analyses of airport cash flow.

Table 9-2

City Airport Options—Comparative Performance Evaluation

Performance Component	Unweighted Evaluation ¹			Weighted		
	Existing Conditions	Renew	Replace	Existing Conditions	Renew	Replace
Implementation	4.5	2.25	4.0	3.6	1.8	3.2
Time to Implement						
Operational Complexity						
Customer Inconvenience						
Environmental Issues and Impacts						
Operations	1.0	3.0	4.5	1.0	3.0	4.5
Operational Efficiency						
Flexibility / Expandability						
Customer Convenience	2.1	4.0	4.6	2.7	5.2	6.0
Curbside						
Ticketing						
Security Screening Checkpoints						
Holdrooms						
Concessions and Amenities						
Baggage Claim						
Walk Distance						
Cost of Overall Program	3.5	3.0	3.0	4.2	3.6	3.6
Total Program Costs						
Future O&M Costs						
Compatibility with Airport Land Use	3.7	3.3	3.0	2.6	2.3	2.1
Existing and Planned Land Use						
Phasing with Other Airport Projects						
Compatibility with Other Projects under Study						
Total	10.3	13.3	15.1	10.5	14.1	16.2

Notes:

¹Performance Ratings: Good = 1, OK = 3, Poor = 5²The average weighting for these purposes is 1.0.Source: Ricondo & Associates, Inc., September 2011.
Prepared by: Ricondo & Associates, Inc., September 2011.

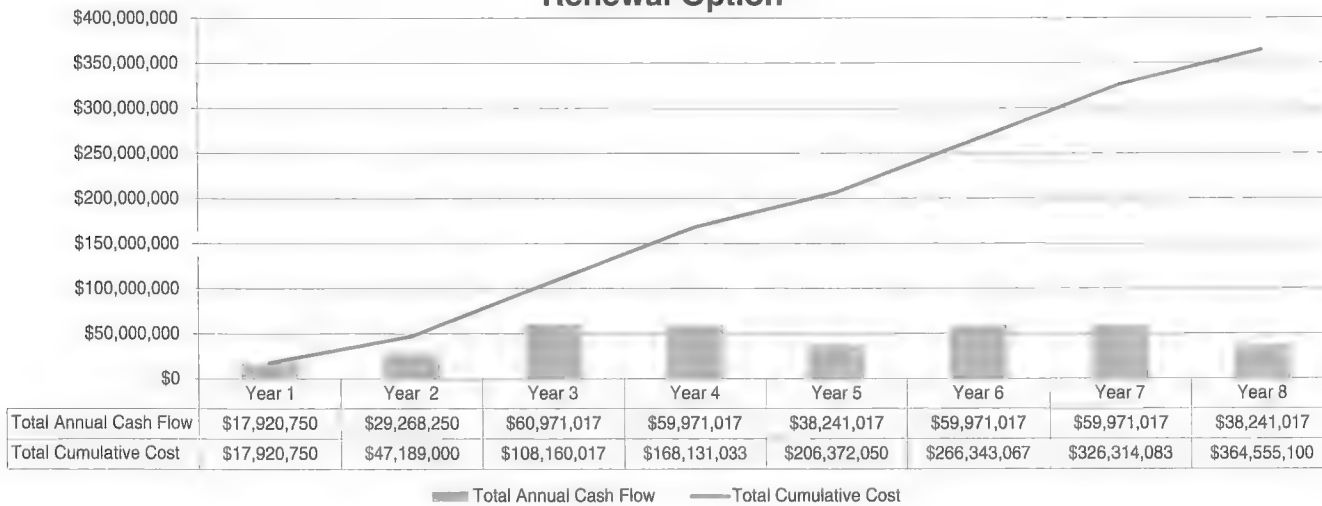
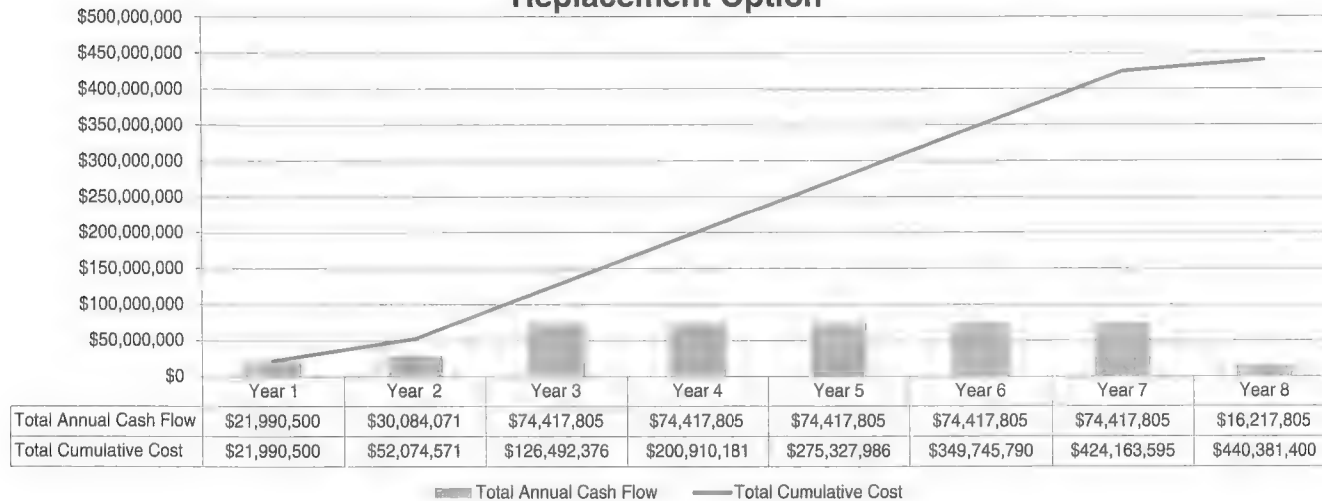
Table 9-3

City Airport Options—Program Cost Estimate Summary

	Program Cost (\$) Renewal Option	Program Cost (\$) Replacement Option
Temporary Construction and Relocations:		
Construct Eight Temporary Gates and Operations Spaces	\$7,500,000	N/A
Construct Associated Temporary Apron	3,750,000	N/A
Construct 10,000 SF Ticketing Lobby and Support Space	2,500,000	N/A
Relocation and Start-up	1,000,000	N/A
Relocate Cargo Facility	N/A	15,000,000
Relocate Rental Car Lot	1,100,000	1,100,000
Relocate Airport Support Facility	4,500,000	N/A
Subtotal Temporary Construction and Relocations	\$20,350,000	\$16,100,000
Airline Leased Space:		
Preferential Leased		
Ticketing and Offices	\$4,500,000	\$8,250,000
Holdrooms	15,000,000	19,250,000
Operations	5,650,000	8,750,000
Bag Service Offices	800,000	1,400,000
Subtotal Preferential Leased	\$25,950,000	\$37,650,000
Joint Use Space		
Baggage Makeup	\$7,500,000	\$11,900,000
Baggage Claim	10,300,000	15,400,000
Tug Drive	2,000,000	4,500,000
Subtotal Joint Use Space	\$19,800,000	\$31,800,000
Total Airline Leased Space	\$45,750,000	\$69,450,000
Building Space:		
Terminal Rentable Space		
Airline Leased Space	\$37,450,000	\$54,600,000
Nonairline Offices	2,000,000	4,550,000
Concessions	14,500,000	24,750,000
Vacant/Other Airline Space	6,350,000	9,100,000
Airport Administration	7,000,000	14,000,000
Total Rentable Space	\$67,300,000	\$107,000,000
Public	\$84,200,000	\$74,250,000
Mechanical / Electrical / Plumbing / Building Structure	\$13,000,000	\$12,600,000
Total Terminal Space	\$164,500,000	\$193,850,000
Additional Requirements:		
Outbound Bag System	\$500,000	\$2,000,000
In-Line Bag Screening	2,000,000	2,000,000
Baggage Claim Units	500,000	1,000,000
Aircraft Apron (adjacent concourses)	3,000,000	20,000,000
Terminal Curbside (2 drop-off lanes and sidewalks)	1,050,000	1,500,000
Extend Airport Loop Roadway	N/A	1,200,000
Total Additional Requirements	\$7,050,000	\$27,700,000
Subtotal Construction Cost	\$237,650,000	\$307,100,000
Phasing Costs for Ongoing Operations	\$47,530,000	\$30,710,000
Planning (1%) & Design (10%)	26,141,500	33,781,000
Program Management (5%)	11,882,500	15,355,000
Contingency (15%)	41,351,100	53,435,400
Total Estimated Cost	\$364,555,100	\$440,381,400

Note: SF= square foot
N/A = not applicable

Source: Ricondo & Associates, Inc., September 2011.
Prepared by: Ricondo & Associates, Inc., September 2011.

Exhibit 9-2**City Airport Options—Timed Program Construction Expenditures****Renewal Option****Replacement Option**

Source: Ricondo & Associates, Inc., September 2011.
 Prepared by: Ricondo & Associates, Inc., September 2011.

Detailed Financial Analysis

During Step 3, a detailed financial analysis should be completed concurrent with qualitative facility evaluations to determine the financial impacts needed to assess each option from an economic standpoint. A detailed financial model produces key financial metrics based on global economic assumptions and assumptions associated with each terminal option. The financial metrics produced by the modeling analysis include:

- Debt per enplaned passenger
- Days of cash on hand
- Cost per enplaned passenger

- Debt service coverage ratio
- Direct terminal costs
- Revenue per enplaned passenger

Discussions of the financial modeling process, key financial metrics, and potential follow-on analyses that an airport operator may undertake to justify a terminal project are provided below. As with other chapters of this Guidebook, the City Airport example is used in this chapter as a basis for describing the financial modeling process. The detailed financial model tables associated with this example are provided for both the terminal replacement and renewal options in Appendix B.

Development of detailed models to analyze the financial impacts of the terminal project on the airport operator, airlines, and other stakeholders is an important element of Step 3. It is critical that the financial model incorporate all of the airport operator's baseline financial and operational assumptions, as well as assumptions for each project alternative. It is also important that financial projections be realistic and supportable. Exhibit 9-3 presents the typical flow of information that is generally included in any airport financial model. The following paragraphs describe this process in more detail, as categorized by inputs and outputs.

Airport Aviation Activity Forecasts

For financial modeling purposes, airport aviation activity forecasts generally include annual enplaned passengers and aircraft landed weight, and sometimes aircraft operations. The forecast

Exhibit 9-3

Typical Inputs for Airport Financial Model

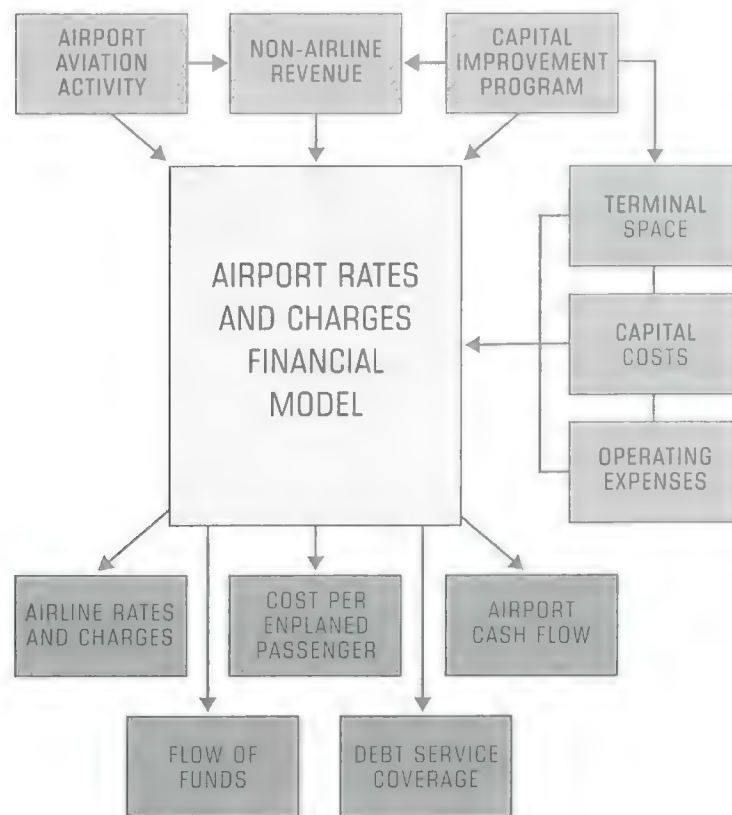
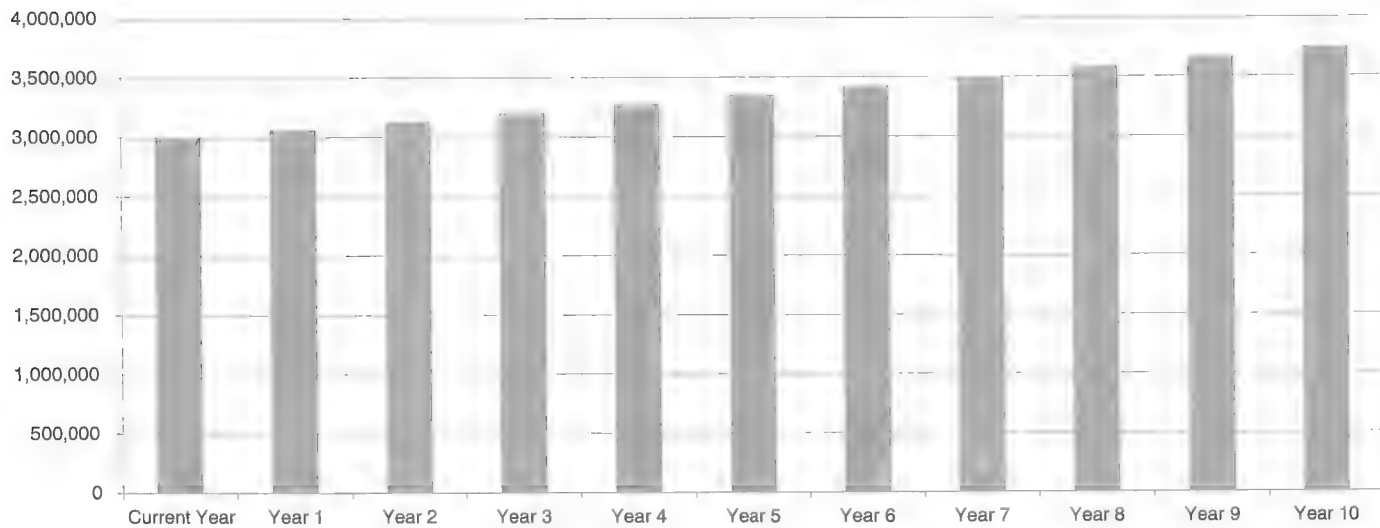


Exhibit 9-4**City Airport—Enplaned Passenger Forecasts****Total Annual Enplaned Passengers (CAGR = 2.25%)**

Note: CAGR = Compounded Annual Growth Rate

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc. September 2011.

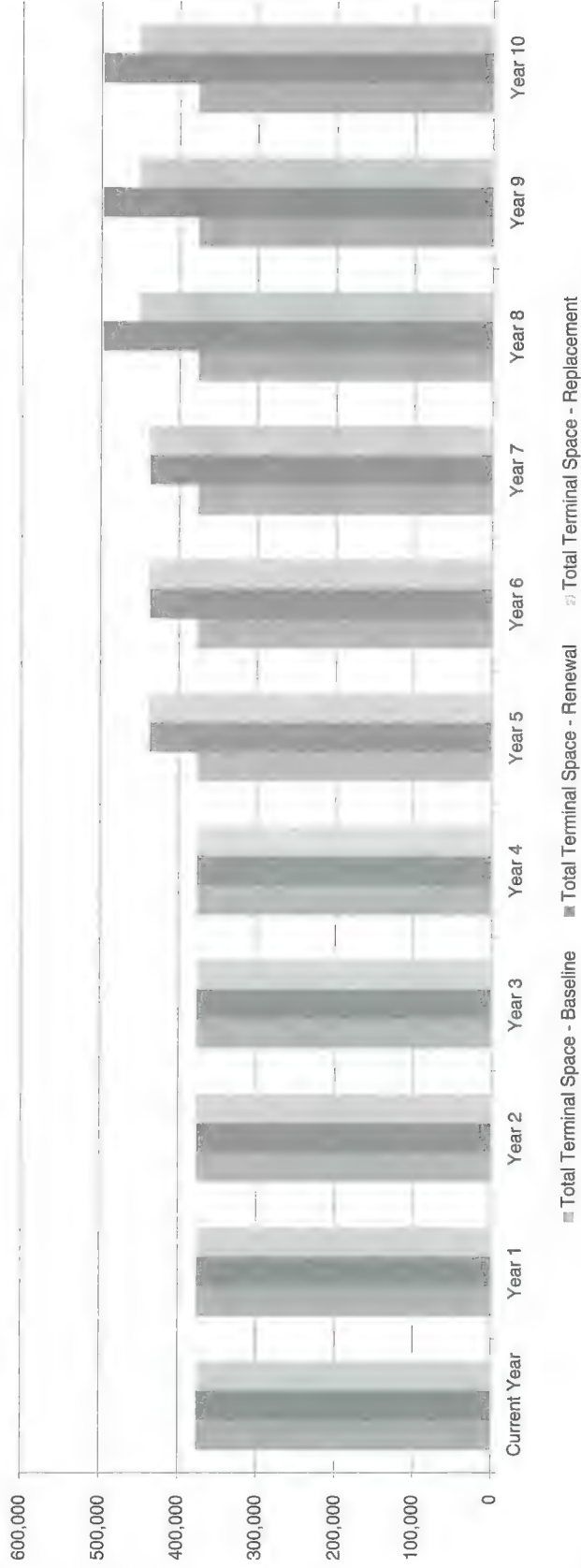
of enplaned passengers drives much of the financial projections. For example, projections of nonairline revenue sources are driven, in large degree, by passenger activity at the airport. These projections, used as model input, will also be key drivers for the future PFC revenues available to support future capital development. The forecast of enplaned passengers also forms the basis for calculating the airport's projected CPE or total cost to the airlines. The forecast of landed weight is primarily used for calculating the landing fee rate. If required, aircraft operations forecasts for the airport can also be completed to assist in various other analyses. Exhibit 9-4 presents a graph of forecast enplaned passengers for the City Airport example. The City Airport's enplaned passengers are estimated to be 3.0 million in the current year and are forecast to increase at a 2.25 percent annual growth rate through the planning period to approximately 3.7 million by Year 10.

Terminal Space Projections

Terminal space projections for each alternative are another primary input into the financial model. The distribution of terminal space is projected by functional area (e.g., ticket counter, holdroom, baggage claim) and category (e.g., rentable, public, administration). The allocation of terminal space is a key factor that, depending on the airline rates and charges methodology in use at the airport, can affect the overall level of terminal cost recovery from the airlines; therefore, it is important to sufficiently detail the allocation of terminal space for each terminal project alternative considered in the financial analysis. Exhibit 9-5 demonstrates the effects of the allocation of terminal space under the terminal renewal and terminal replacement options considered for the City Airport. Years 5 and 8 mark phases in which additional space would be placed in service for the terminal development options.

Exhibit 9-5

City Airport Options—Terminal Space and Terminal Project Impacts



Notes:

1. Years 5 and 8 mark incremental space impacts associated with the terminal development option.
2. The replacement option is generally considered to have a more efficient layout, and would, therefore, provide more rentable space within a smaller overall terminal footprint.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011

As shown on Exhibit 9-5, the total terminal space required for the renewal option was assumed to be greater than for the replacement option. This assumption was made given that a replacement option on a “greenfield” site is generally considered to be a more efficient layout in meeting facility requirements than a renewal option where limitations of the existing structure can present certain inefficiencies in meeting the same requirements.

Capital Improvement Program

A CIP and project cost estimates are also key inputs into a detailed financial model. The airport operator’s CIP should contain a comprehensive set of capital projects that are planned to be undertaken over the next several years. When evaluating specific terminal development options, the CIP should be modified as needed to implement each option. Other key considerations when incorporating a CIP into a financial model are project phasing, estimated annual cash flows, project operational dates, and the various airport cost centers that would be affected by the projects. Assumptions regarding funding sources to be applied to those projects should then be considered, as in Step 1. Capital project costs are generally estimated in current dollars and then escalated for inflation within the context of a financial model. Exhibit 9-6 presents the typical process for analyzing the financial impacts associated with an airport CIP.

Exhibit 9-7 presents the project costs and funding sources for the City Airport example for both the terminal renewal and terminal replacement options. As presented, the CIP project costs are consistent between the options at approximately \$51.2 million; however, the cost of the replacement terminal option is approximately \$82.6 million more than the cost of the renewal terminal option. This information is presented in escalated dollars.

Projections of Operating Expenses and Nonairline Revenues

A detailed financial model should contain projections of operating expenses and nonairline revenues. These projections, as discussed in Step 1, are typically developed for specific line items, where applicable, and allocated to appropriate airport cost centers. To assist in the development of operating expense projections, it is important to understand historical trends, current airport maintenance contracts and agreements, personnel and benefit obligations, utility and energy use, and the distribution of responsibilities between the airport operator and the airlines, among other factors. Also, it is important to determine if any incremental impacts to operating expenses and nonairline revenues may be associated with the airport operator’s CIP. This is generally true when analyzing terminal improvement projects. Operating expense projections are typically increased with inflation or in some cases at levels above inflation (e.g., recent health insurance costs, retirement obligations, and energy costs have been increasing rapidly). Nonairline revenues generally tend to increase with forecast passenger activity and also by some factor of inflation. Such growth assumptions are generally developed for each specific line item, as different line items can be affected by inflation, passenger growth, and other factors to varying degrees.

Exhibit 9-8 and Exhibit 9-9 present projected direct terminal operating expenses on a per-square-foot basis and terminal nonairline revenue for the City Airport, respectively. These projections are presented for both terminal redevelopment options. As presented on Exhibit 9-7, operating costs per square foot of terminal space are projected to decline in Years 5 and 8 after the new terminal becomes operational. This assumption is based on the new space being more efficient in terms of maintenance and energy use; however, in aggregate, these expenses are projected to increase as a result of the additional space. Terminal nonairline revenues are expected to increase over baseline projections starting in Year 5, as depicted on Exhibit 9-9. The basis for this assumption is that the new terminal configurations are more efficient, concession space increases, and passenger flow and spend would be optimized for future terminal concession programs.

Exhibit 9-6

Detailed Financial Analysis/Typical Inputs for Airport Financial Model

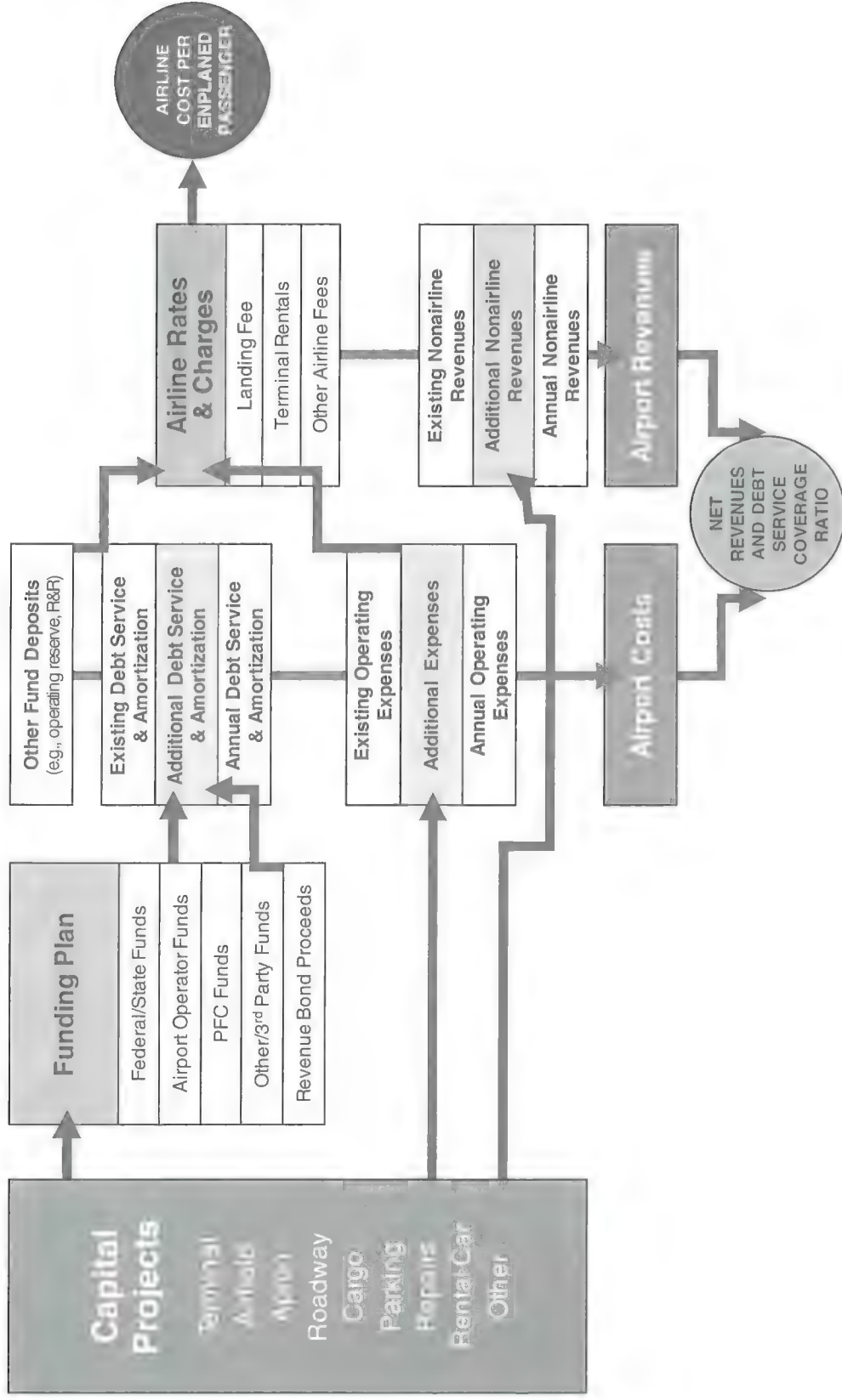
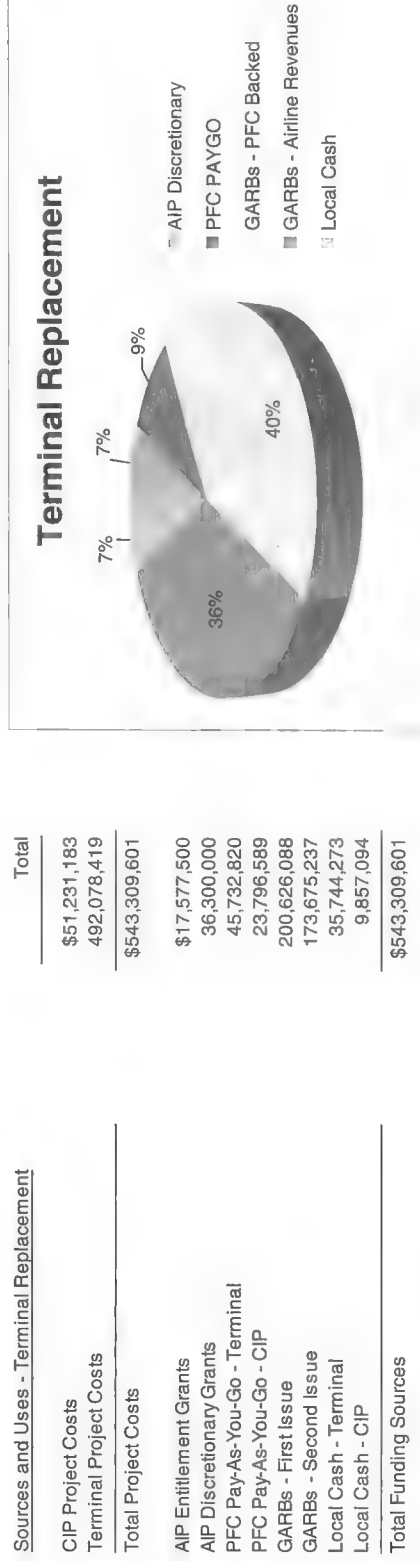
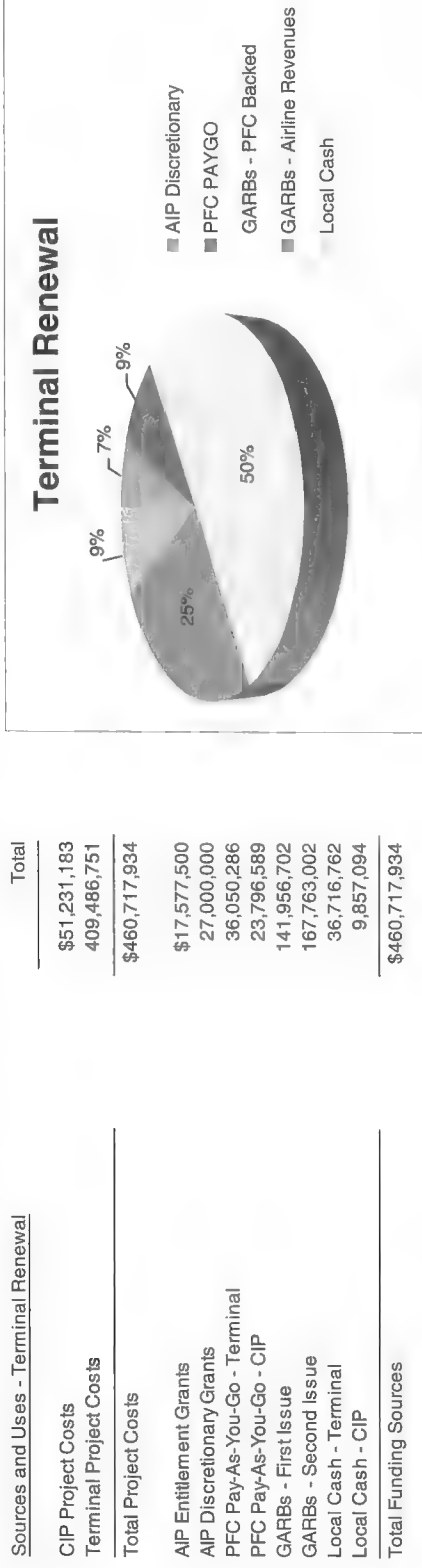


Exhibit 9-7

City Airport Options—Summary of 10-Year CIP and Total Cost by Funding Source (Escalated Dollars)



Difference in Total Funding Sources =

\$ 82,591,667

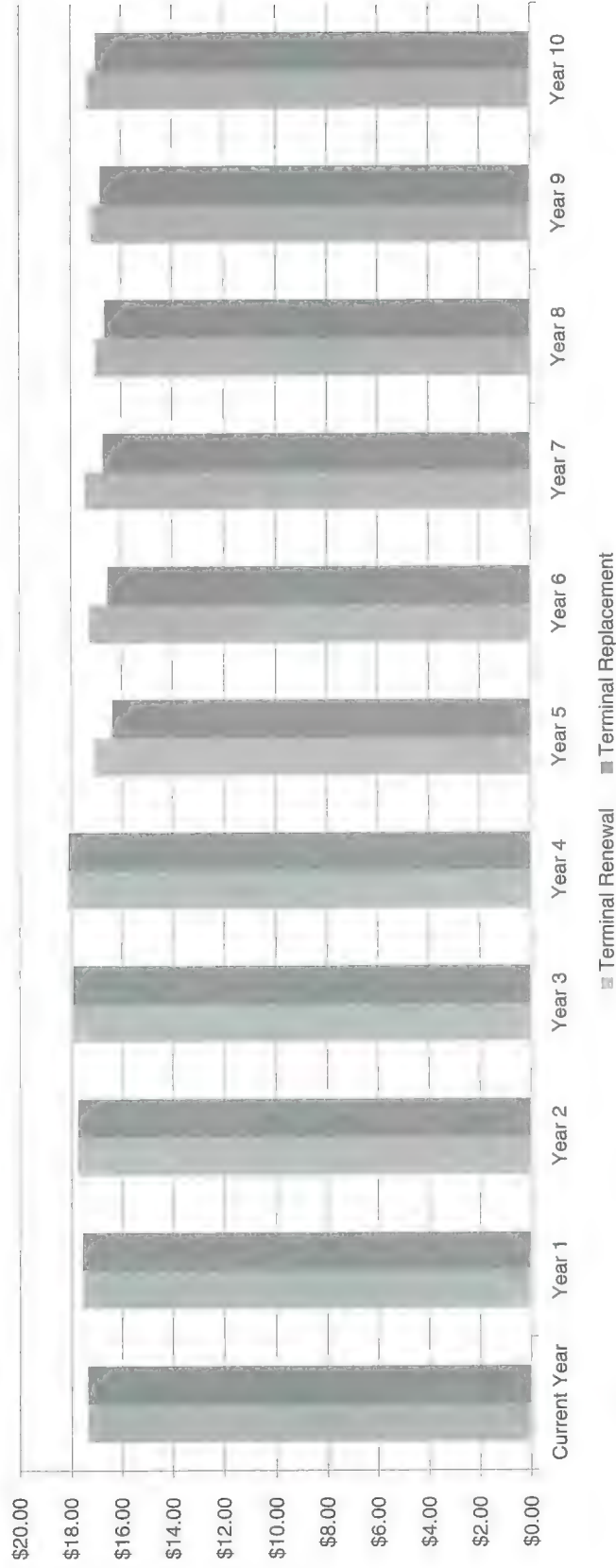
Note:

1. Totals may not add due to rounding.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Exhibit 9-8

City Airport Options—Direct Terminal O&M Expenses per Square Foot (Current Year Dollars)



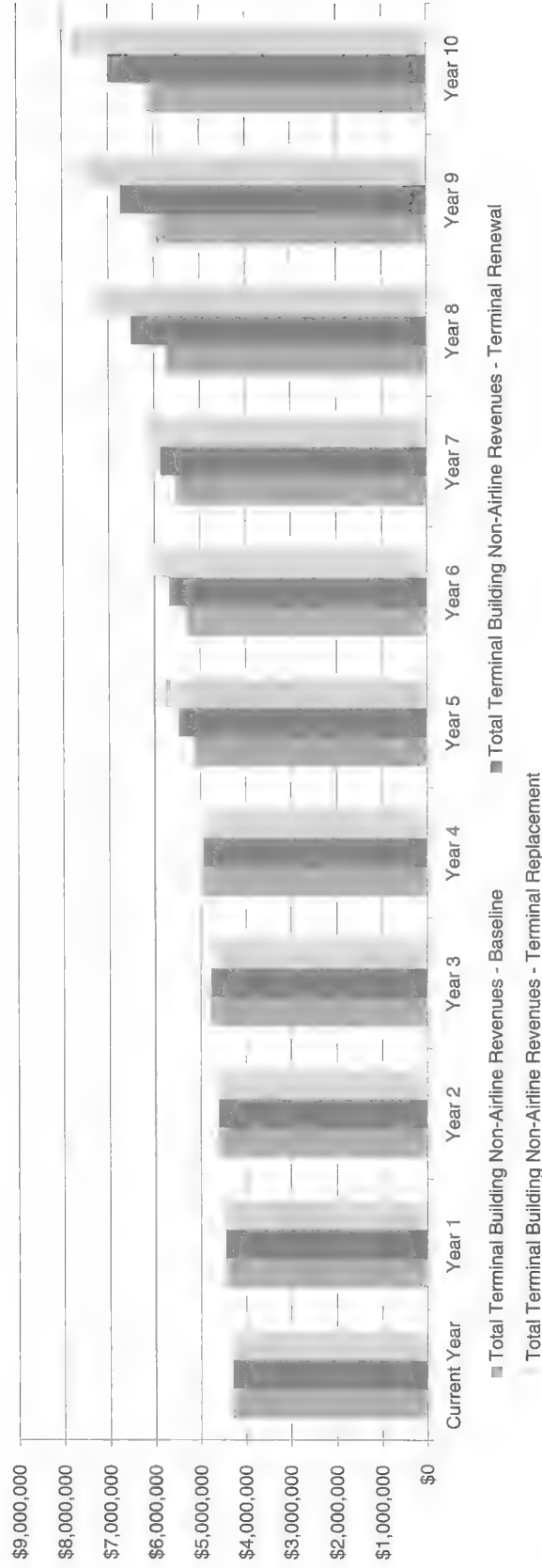
Notes:

1. Years 5 and 8 mark the incremental O&M expense impacts of the assumed terminal development options.
2. It was assumed that the new space would be more efficient in terms of maintenance and energy use, thus leading to reduced unit O&M expenses. However, in aggregate, O&M expenses are projected to be greater given the additional space associated with these options.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Exhibit 9-9

City Airport Options—Terminal Nonairline Revenue Impacts



Notes:

1. Years 5 and 8 mark the incremental nonairline revenue impacts of the assumed terminal project alternative.
2. The new terminal configurations would be more efficient, increase concession space, and optimize passenger flow, thereby leading to increased spend rates for future terminal concessions.
3. Cumulative nonairline revenues in Year 10 for the baseline, terminal renewal, and terminal replacement options are projected to be \$56.9 million, \$60.3 million, and \$63.6 million, respectively.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Debt Service Projections

Developing projections of debt service requirements to support the funding needs of future capital development is another fundamental purpose of an airport financial model. Given the size and scope of the project costs associated with the terminal replacement and renewal options for the City Airport, additional debt is a required funding source. Exhibit 9-10 presents projected terminal annual net debt service for both the terminal renewal and replacement options after PFC revenues have been applied towards debt service based on eligibility assumptions, which is an effective method of mitigating increases to airline costs or CPE. As presented, the net debt service requirements are higher for the terminal replacement option compared to the terminal renewal option.

Once all of the inputs are incorporated into the airport financial model, certain outputs and results can be calculated, as depicted earlier in Exhibit 9-6. These outputs are described and placed in context for the City Airport example in the paragraphs that follow.

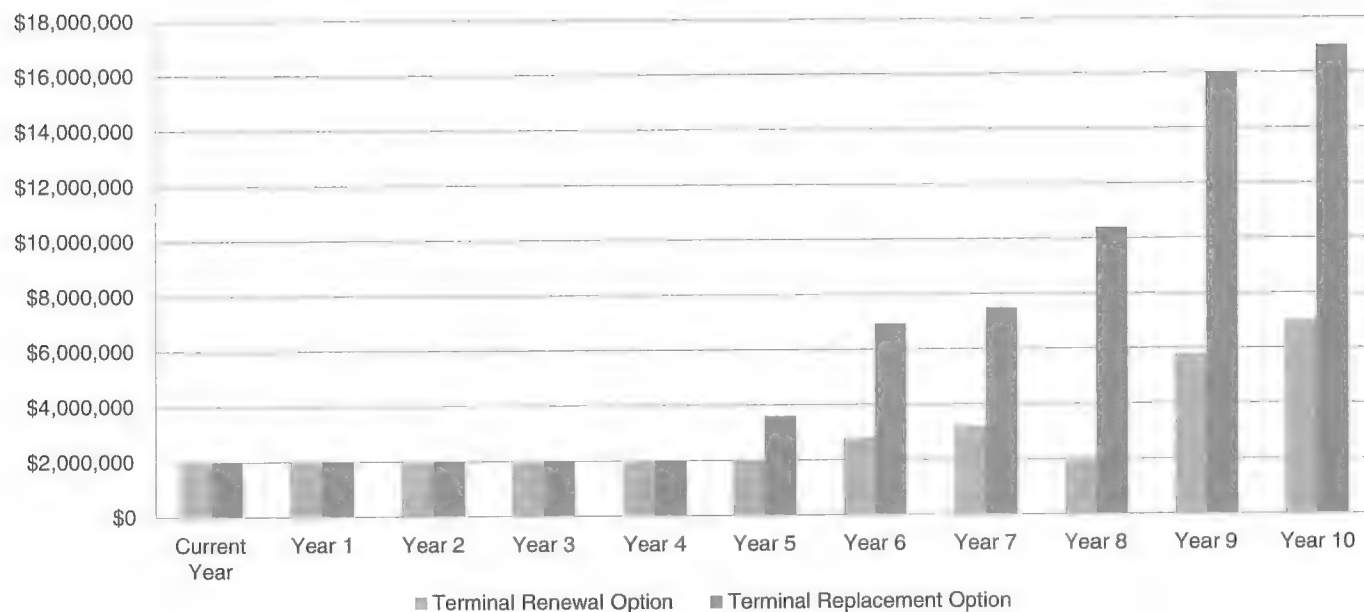
Model Outputs Airline Rates and Charges

Airline rates and charges are generally calculated from the airport operator's established or assumed airline rate-setting methodology. This methodology includes the specific rate structure for both the landing fee and the terminal rental rate, as well as other fees, such as an apron fee.

Exhibit 9-10

City Airport Options—Future Terminal Debt Service (Net of PFC Revenues)

Terminal Debt Service (Net of PFCs)

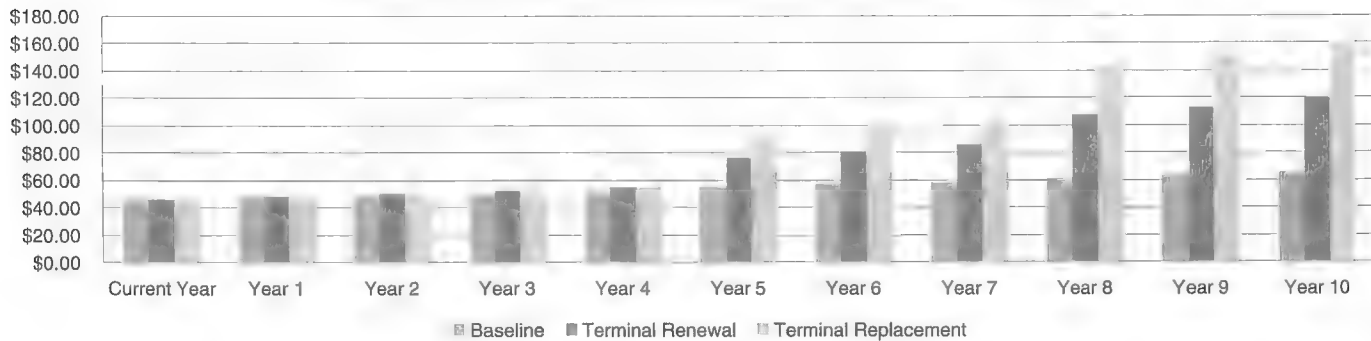
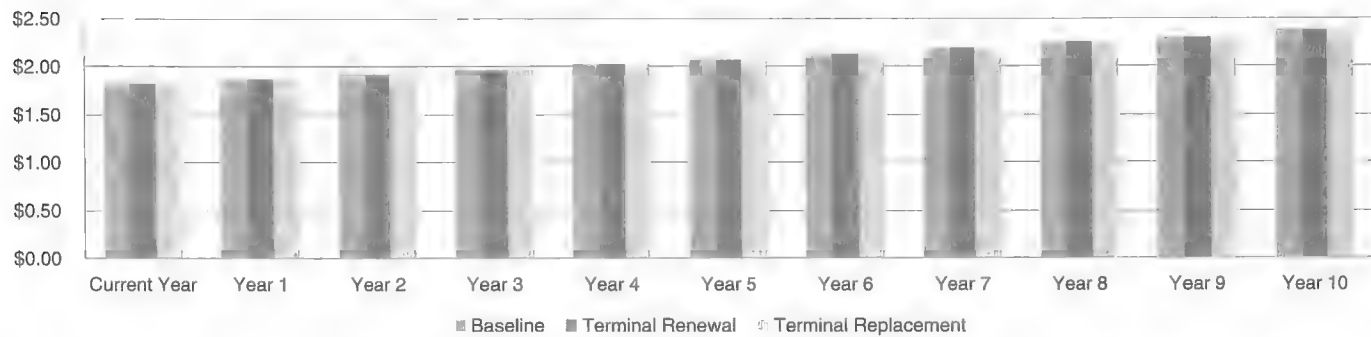


Notes:

1. Years 5 and 8 mark the incremental nonairline revenue impacts associated with the assumed terminal development option.
2. Cumulative debt service in Year 10 for the terminal renewal and terminal replacement alternatives is projected to be \$32.8 million and \$71.5 million, respectively.

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc. September 2011.

Exhibit 9-11**City Airport—Terminal Project Airline Rate Impacts (Residual Rate-Setting Methodology)****Signatory Terminal Rental Rate (per Square Foot)****Signatory Landing Fee (per 1,000 pounds of Landed Weight)****Notes:**

1. Years 5 and 8 mark the incremental impacts of the assumed terminal development option.
2. The terminal rental rate increases reflect increases in debt service and associated changes in operating expenses and nonairline revenues.

Source: Ricondo & Associates, Inc. September 2011.

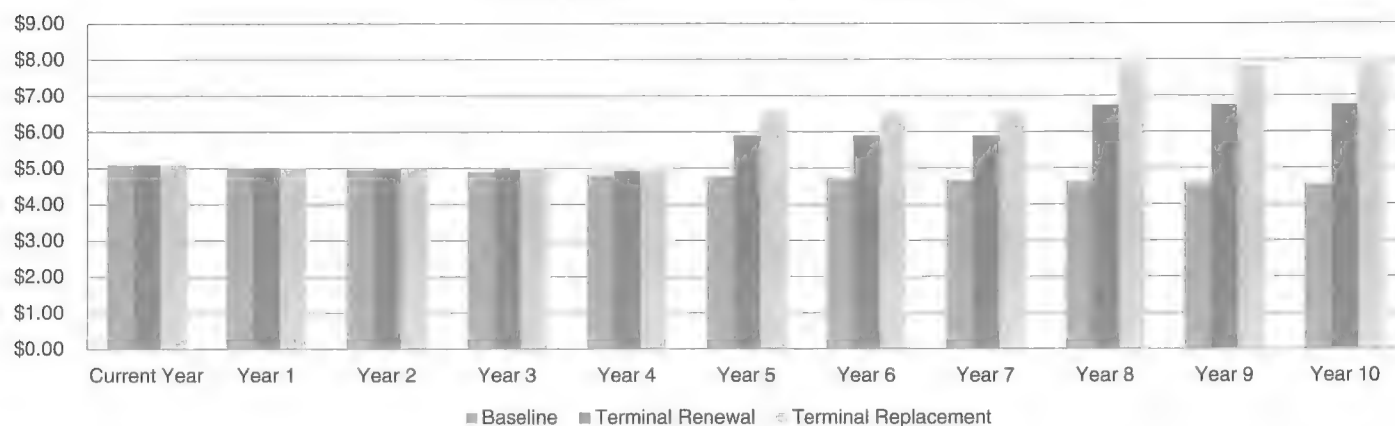
Prepared by: Ricondo & Associates, Inc. September 2011.

Airline rate-setting methodologies can range from a fully residual approach to a fully compensatory approach, with many airport operators using a blended approach that incorporates elements from each methodology (hybrid). In many instances, an airport operator and its tenant airlines may want to analyze alternative rates and charges methodologies when a terminal project is being considered, as implementation of the project may change the cost structure of the airport significantly. As such, financial modeling of various airline rates and charges methodologies may need to be considered for each terminal development option to assess how each methodology would affect the costs to the airlines, or the resultant CPE. Exhibit 9-11 presents the terminal rental rate and landing fee calculated for the City Airport example, in which a cost center residual airline rate-setting methodology was assumed. As presented, the terminal rental rate increases in concert with the stages of development of the terminal project, which reflects increases in debt service and associated changes in operating expenses and nonairline revenues. There would be minimal changes to the landing fee as the airfield cost center cost structure is not materially altered between alternatives.

The resultant CPE for the City Airport is presented in current dollars on Exhibit 9-12. The CPE is a generally accepted metric and can be critical when negotiating terminal projects with the airlines. As presented on the exhibit, CPE increases in concert with the various operational

Exhibit 9-12

City Airport—CPE Impacts (Current Year Dollars)

Cost per Enplaned Passenger**Notes:**

1. Years 5 and 8 mark the incremental impacts of the assumed terminal development option.
2. The terminal replacement option results in a higher CPE than the terminal renewal option primarily because of the assumed increase in debt service for the terminal replacement option.

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc. September 2011.

dates of the terminal development. The terminal replacement option results in a higher CPE than the terminal renewal option. The primary cause for this in the City Airport case is that the increase in operating expenses and debt service required to fund the terminal development more than offsets the enhancements achieved through improved terminal nonairline revenues. An increase in CPE can be typical at airports undertaking major terminal projects.

As mentioned earlier, copies of all financial tables associated with this analysis are provided in Appendix B.

Key Financial Metrics

The outputs from the financial model can help the airport operator evaluate the effects of each set of terminal development option assumptions on financial performance. The following key metrics may allow the airport operator to quantify and compare the projected financial impacts from each terminal development option.

Table 9-4 and Table 9-5 present a sampling a key financial metrics calculated from the financial model for the City Airport example. Additional detail on certain metrics yet to be discussed in this Guidebook is provided below.

Debt Service Coverage Ratio

The debt service coverage ratio generally takes into account the revenue remaining after operating expenses are paid (i.e., net revenue) compared to annual debt service. In most cases, higher debt service coverage ratios are more attractive to the investment community; however, debt service coverage ratios are highly dependent upon an airport operator's airline rate-setting methodology (e.g., residual methodologies generally have lower debt service coverage ratios).

Table 9-4

City Airport —Summary Financial Metrics for Terminal Renewal Option

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Projected Enplaned Passenger	3,000,000	3,068,000	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,665,000	3,748,000
Debt per Enplaned Passenger	\$12.98	\$12.15	\$11.32	\$64.79	\$61.86	\$58.94	\$116.31	\$111.14	\$105.97	\$100.85	\$95.71
Days Cash On Hand (Ending Balance)	441	399	336	297	206	203	224	216	185	201	205
CPE	\$5.11	\$5.17	\$5.29	\$5.42	\$5.55	\$6.83	\$7.05	\$7.25	\$8.55	\$8.82	\$9.08
CPE—Year 1 Current Dollars	\$5.11	\$5.02	\$4.98	\$4.96	\$4.93	\$5.90	\$5.90	\$5.90	\$6.75	\$6.76	\$6.75
Coverage Ratio	1.86	1.86	1.87	1.87	1.88	1.42	1.51	1.51	1.41	1.39	1.39
Direct Terminal Expenses per Sq. Ft.	\$17.35	\$18.06	\$18.80	\$19.58	\$20.38	\$19.79	\$20.59	\$21.42	\$21.57	\$22.42	\$23.32
Revenue per Enplaned Passenger:											
Food and Beverage	\$0.60	\$0.61	\$0.62	\$0.63	\$0.64	\$0.69	\$0.70	\$0.71	\$0.78	\$0.79	\$0.80
News and Gifts	\$0.57	\$0.57	\$0.58	\$0.59	\$0.60	\$0.66	\$0.66	\$0.67	\$0.74	\$0.75	\$0.76
Parking	\$5.33	\$5.41	\$5.49	\$5.57	\$5.65	\$5.73	\$5.82	\$5.90	\$5.99	\$6.08	\$6.17
Rental Car	\$2.67	\$2.71	\$2.74	\$2.78	\$2.83	\$2.87	\$2.91	\$2.95	\$2.99	\$3.04	\$3.08

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table 9-5

City Airport—Summary Financial Metrics for Terminal Replacement Option

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Projected Enplaned Passenger	3,000,000	3,068,000	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,665,000	3,748,000
Debt per Enplaned Passenger	\$12.98	\$12.69	\$12.42	\$90.07	\$86.90	\$83.74	\$143.91	\$138.44	\$133.00	\$127.62	\$122.23
Days Cash On Hand (Ending Balance)	441	391	327	317	236	218	230	222	236	256	258
CPE	\$5.11	\$5.17	\$5.29	\$5.43	\$5.53	\$7.65	\$7.82	\$8.04	\$9.98	\$10.28	\$10.57
CPE—Year 1 Current Dollars	\$5.11	\$5.02	\$4.99	\$4.97	\$4.92	\$6.60	\$6.55	\$6.54	\$7.88	\$7.87	\$7.86
Coverage Ratio	1.86	1.86	1.87	1.87	1.88	1.37	1.45	1.45	1.37	1.37	1.37
Direct Terminal Expenses per Sq. Ft.	17.35	18.06	18.80	19.58	20.38	18.98	19.76	20.56	21.09	21.95	22.85
Revenue per Enplaned Passenger:											
Food and Beverage	\$0.60	\$0.61	\$0.62	\$0.63	\$0.64	\$0.73	\$0.74	\$0.75	\$0.85	\$0.87	\$0.88
News and Gifts	\$0.57	\$0.57	\$0.58	\$0.59	\$0.60	\$0.69	\$0.70	\$0.71	\$0.81	\$0.82	\$0.83
Parking	\$5.33	\$5.41	\$5.49	\$5.57	\$5.65	\$5.73	\$5.82	\$5.90	\$5.99	\$6.08	\$6.17
Rental Car	\$2.67	\$2.71	\$2.74	\$2.78	\$2.83	\$2.87	\$2.91	\$2.95	\$2.99	\$3.04	\$3.08

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Days Cash on Hand

Days cash on hand is calculated based on the amount of unrestricted discretionary cash the airport operator has in comparison to its annual operating expenses. This metric is generally an estimate of how long the airport operator can operate if revenues were zero. A higher number of days cash on hand usually indicates a stronger cash position of the airport enterprise; however, it may not be beneficial to have an unreasonable amount of cash on hand, as it could otherwise be used to provide a better return in an alternative airport investment opportunity.

Debt per Enplaned Passenger

The debt per enplaned passenger metric is used to assess the airport operator's debt obligations in relation to the numbers of enplaned passengers at the airport. An airport operator can consider this metric when evaluating how much debt it can afford. The airport operator may also consider the cash contribution to the terminal redevelopment in managing debt service obligations. By contributing additional available cash to the project, an airport operator may be able to reduce the size of future bond issues, thereby lowering the costs of issuance, annual debt service payments, and debt per enplaned passenger.

Use of Financial Metrics

To provide a better understanding of how these various financial metrics at the airport under consideration may compare to metrics at other airports regionally or throughout the nation, several sources of information can be referenced. These sources include bond rating agencies, airport and airline trade organizations (the American Association of Airport Executives [AAAE], Airports Council International-North America [ACI-NA], Airlines for America [A4A], etc.), the FAA, financial information in consolidated annual financial reports of other airports, official statements from recent bond issues, or airport websites. Some common sources containing industry financial benchmarking information include the following:

- ACI-North America Benchmarking Surveys
- AAAE Rates and Charges Surveys
- FAA Compliance Activity Tracking System (CATS)—Airport Financial Reports
- U.S. Airport Medians from Moody's Investors Service

When considering the use of financial benchmarking data, it is important that the data be considered in the appropriate context when comparing them to data from other airports. Several factors can be misleading as to why certain financial measures may vary among airports. For example, the CPE at one airport may not include all of the costs included in the CPE at another airport, or the type of rate-making methodology can significantly dictate the level of an airport's debt service ratio. Fully understanding the information used when comparing it can help avoid some common pitfalls.

Sensitivity Analyses

An airport operator can typically better understand its overall financial risk by performing sensitivity analyses on the financial model for each terminal development option, as it is likely that all future assumptions may not materialize and, in some cases, could vary materially. The purpose of sensitivity analyses is to evaluate how changes in the global assumptions underlying the analysis might affect the key financial metrics for each option. The effects may vary from minor to significant, depending on the degree of change to the assumptions, and may potentially provide valuable information regarding the "what if" questions that could be raised by an airport operator, stakeholders, or bond rating agencies. Typical changes to the global assumptions can

Table 9-6

City Airport—Sensitivity Analysis Comparison—Terminal Renewal Option, Year 8

	Global Assumptions	Reduced Activity Scenario	Project Cost Increase Scenario
Projected Enplaned Passenger	3,585,000	3,316,000	3,585,000
Terminal Project Alternative Cost	\$409,486,751	\$409,486,751	\$450,435,427
Nominal CPE	\$8.55	\$10.44	\$9.64
Real CPE—Current Dollars	\$6.75	\$8.25	\$7.61
Real CPE—Variance		\$1.50	\$0.86

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

include the level of aviation activity growth, operating expenses, nonairline revenue growth, and other capital projects to be undertaken in the CIP, including project costs. These changes may ultimately affect the airport operator's financial performance, including airline rates and charges and other financial metrics. Assumptions associated with the terminal development options may also be adjusted, typically the construction period, date of beneficial occupancy, or the total cost of the option. Changes to these assumptions can affect annual debt service as well as the timing of the incremental impacts to operating expenses and nonairline revenues, which may, in turn, affect airline rates and charges and financial metrics. The airport operator may also choose to adjust the assumed magnitude of the incremental impacts.

Table 9-6 and Table 9-7 present sensitivity analyses for the City Airport terminal development options and a comparison of the impacts of changes in activity growth and project cost assumptions on the financial model and metrics. These tables present the effects in Year 8, the assumed first full year of terminal development completion. In the first sensitivity analysis, a 1 percent annual reduction in the enplaned passenger growth rate was assumed compared to the baseline assumption of 2.25 percent annual growth. In the second sensitivity analysis, a 10 percent increase in project costs was assumed for each option.

As presented, sensitivity analyses can be useful in assessing the financial risk associated with undertaking capital development. They can be valuable in understanding which assumptions or variables can significantly affect financial results to account for such risks during the planning process. Additionally, it is unlikely that all assumptions will occur as planned and understanding the financial results under more than one outcome can assist in better understanding overall financial risk.

Table 9-7

City Airport—Sensitivity Analysis Comparison—Terminal Replacement Option, Year 8

	Global Assumptions	Reduced Activity Scenario	Project Cost Increase Scenario
Projected Enplaned Passenger	3,585,000	3,316,000	3,585,000
Terminal Project Alternative Cost	\$492,078,419	\$492,078,419	\$541,286,261
Nominal CPE	\$9.98	\$12.34	\$11.14
Real CPE—Current Dollars	\$7.88	\$9.74	\$8.80
Real CPE—Variance		\$1.86	\$0.92

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

Summary

In the City Airport example, both the terminal renewal and replacement options appear to be within the reasonable cost levels established in Step 1, with a \$9.00 CPE target, as expressed in current year dollars. However, it should be noted that the reduced activity sensitivity analysis for the replacement option could pose some financial risk and exceed the CPE target.

From a purely financial perspective, the terminal renewal option appears to be more financially sound than terminal replacement, primarily given its lower CPE. However, at this point, the airport operator and stakeholders may choose to further analyze the potential economic benefits of each option to further justify selection of the preferred option.

Capital Justification

In many cases, the lowest cost terminal development option or the best option from a financial standpoint may not always be the most prudent development to undertake. In other words, when the financial analysis is completed and one option results in a higher CPE (for example), it is important to determine if that incremental CPE is justifiable. In this example, the increased CPE could be warranted through certain quantifiable measures, such as lower aircraft operating costs, fewer aircraft delays, better passenger processing times, and other measures. Or, in some cases, this justification could be realized through qualitative determinations, or a combination of both.

For the above reasons, it can be beneficial for an airport operator to further evaluate both the quantifiable and qualitative justifications for each terminal development option against its overall goals and objectives prior to making a determination purely for financial reasons. Identifying these justifications can assist an airport operator in justifying the terminal development option to key airport stakeholders, such as the airlines, the FAA, airport board members, and other airport tenants. This analysis can be a traditional BCA for the purposes of applying for an FAA LOI or other grant request. It can also be tailored as a business case to a specific stakeholder to demonstrate how the project's operational benefits justify the financial commitment to implement it. Typical capital justifications associated with a terminal replacement or renewal are provided below.

Examples of Quantifiable Justification

- Airline delay savings is a measurement, in minutes, of time saved from avoided operational delays as a result of a capital project at an airport. This measurement can be applied to aircraft operations as well as passengers. A project alternative yielding a high level of delay savings may generally be looked upon favorably by the airlines operating at the airport and by passengers. The delay savings at the airport may also provide downstream delay benefits throughout the national airspace system.
- An airport operator could also consider the aircraft travel time from the runway ends for each terminal development option. A project alternative that would lessen this travel time could ultimately provide delay reduction and enable additional aircraft turns at the airport. Passengers may also benefit from reduced taxiing times.
- Dual taxilanes between concourses can also reduce operational delays at the airport by allowing more aircraft to efficiently queue on taxiways prior to takeoff. The additional expense of constructing dual taxilanes could be offset by the operational benefit.
- A terminal development option that provides better passenger flow can also provide passenger delay savings and allow for enhanced security measures and increased concession revenues. An airport operator can achieve benefits from selecting such an option even if it is not the lowest cost option.

Examples of Qualitative Justification

- A terminal development option that allows for enhanced safety/security measures may provide additional value beyond the cost of the project. Meeting all required local, state, and federal safety and security measures should be mandated for all development options; however, those that may achieve further security and safety enhancements above the requirements may provide additional value that should be considered in the decision-making process.
- Operational efficiency can be measured during project construction as well as after project completion and may not always be quantifiable. For example, a terminal renewal option may require operating in the terminal during construction, which could disrupt airline and other tenant operations, and may cause some confusion for passengers at the airport. A renewal project can also add burden on airport operator staff given the potential disruption to the facility. In many cases, this disruption can add cost to the project, and can be challenging to quantify during the planning process. However, such operational efficiencies should be a consideration, if applicable, as they can have a major impact.
- An environmentally friendly terminal development option may offset the additional costs of the project by creating value in both the potential for reduced future utility expenses in the terminal, as well as enhancing the perception of the airport. A green initiative can also provide opportunities for ecofriendly concessionaires to operate at the airport that otherwise would not. Project alternatives that meet only the minimal environmental requirements could be at risk of additional expense associated with upgrades needed if environmental standards are changed.
- Local/regional perceptions of development options could be influenced by safety/security concerns, environmental friendliness, and other factors, such as job creation, and whether or not the airport operator needs to acquire additional land for terminal replacement. Having local/regional support for a development option can be a factor in justifying the selected option to key airport stakeholders and may also be beneficial in receiving additional state, local, and third-party funds that may become available.

Step 4: Document Results from the Analyses

The principal goal of Step 4 is to document results from the analyses. Typically, the project documentation would be referred to as the Terminal Redevelopment Program, as it would contain:

- Pertinent statements from the airport Strategic Plan or Master Plan
- Commercial passenger activity forecasts
- Specific goals and objectives for redeveloping the terminal
- Concept design
- Terminal space and other statistical requirements
- Financial Analysis

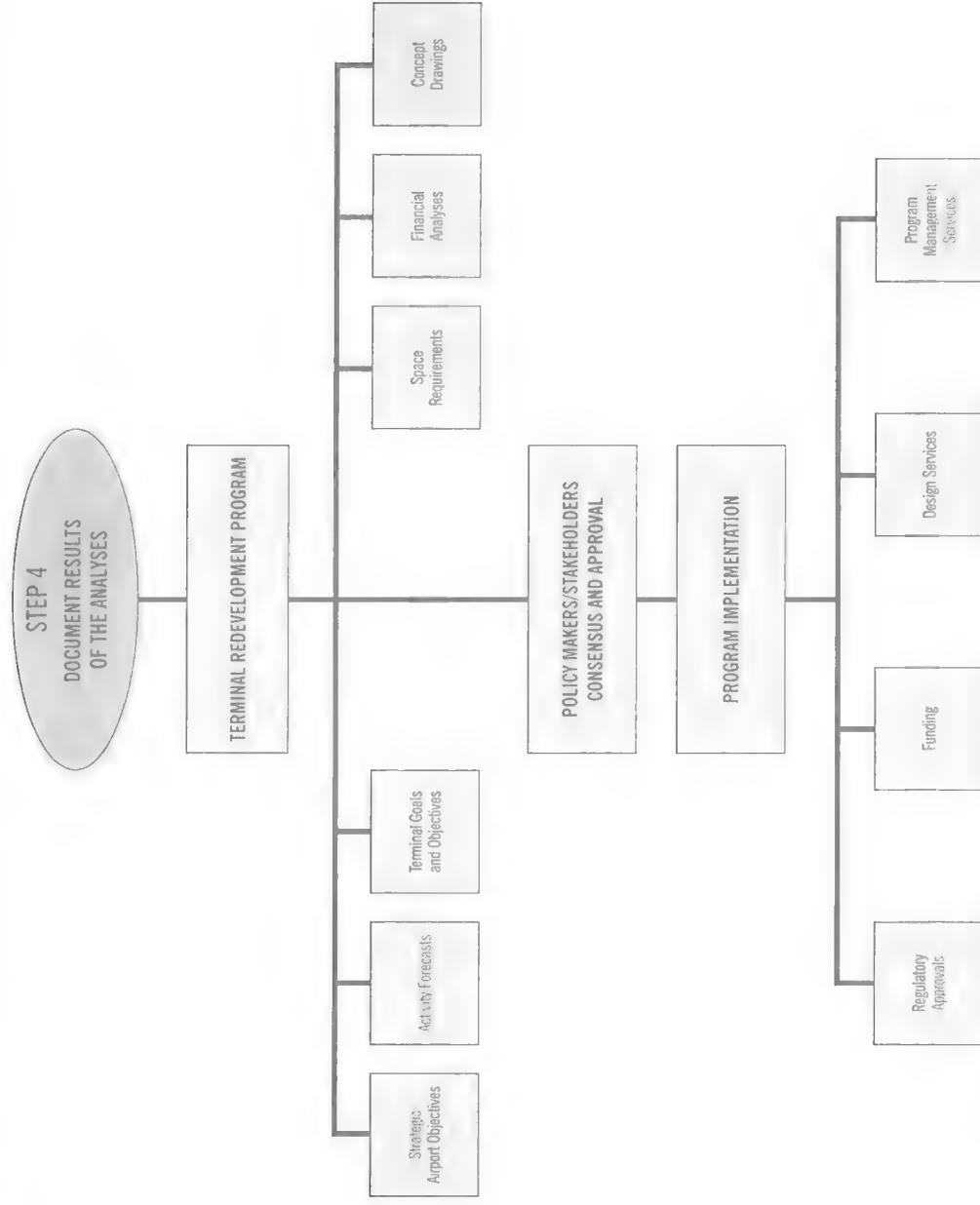
Exhibit 10-1 illustrates the typical activities that occur in Step 4, under which the Terminal Redevelopment Program transitions from a planning process to an implementation process. The Terminal Redevelopment Program documentation, which documents the results from the analyses, conveys the scope, conceptual design, and relationships among the terminal facilities to an implementation team that, for the most part, was not involved in the planning process.

Users of the Guidebook will necessarily tailor the documentation to meet the practices and standards of the particular airport under consideration. For example, the Terminal Redevelopment Program may be a concise brief that is tailored to convey only needed information to a design team, and a separate comprehensive planning report would be prepared to document the analyses and outcomes from the preceding steps.

Similarly, the activity sequence of program implementation activities will necessarily be tailored to the specifics of the redevelopment program. For example, the program could require an environmental approval process prior to commencing full implementation activities.

Exhibit 10-1

Step 4 Process Diagram



Glossary and Acronyms

A.1 Glossary

The definitions of terms given below are only applicable to this Guidebook. The terms and concepts may have different meanings in different contexts.

Airline Leased Space—Terminal spaces, typically gates and holdrooms, rented to individual airlines for their exclusive or preferential use.

Airplane Design Group (ADG)—A grouping of airplanes based on wingspan specified by the Federal Aviation Administration (FAA) and documented in FAA Advisory Circular 150/5300-13.¹

Benefit-Cost Analyses (BCA)—An analytical process used to calculate and compare project benefits and project costs. Both benefits and costs can be quantitative (dollar value, or delay levels) and qualitative (terminal appearance or congestion). A BCA is conducted using defined procedures when required by the FAA for project approvals and funding.

Bond Rating—Grade assigned to bonds by rating agencies, according to the agencies' definitions and procedures, to inform investors on the security of the bonds.

Brainstorming—A method of bringing stakeholders together to develop a solution to a specific problem by gathering a list of ideas, issues, and strategies.

Building Information Modeling—Refers to systems, models, and commuter programs used to monitor and analyze (typically on a real-time basis) building systems and operations.

Capital Improvement Program (CIP)—The planned airport capital projects budgeted by the specific airport operator. This program is typically prepared annually for the succeeding 5 to 10 years and can be funded from multiple sources, including airport revenues, federal funds, passenger facility charges (PFCs), and other sources.

City Airport—Specific to this Guidebook, a typical mid-sized airport and terminal facility with defined characteristics. The characteristics of the City Airport example are used to illustrate the typical issues, analyses, and evaluations associated with the decision to renew or replace an airport terminal.

Common Use—Related to the shared use of terminal elements by the airport operator, airlines, and other airport tenants.

Comparative Performance Evaluation—A comparison of options that qualitatively measures the relative differences in performance (connect times, baggage travel distances, maintainability),

¹Federal Aviation Administration, *Airport Design, Advisory Circular 150/5300-13 (and Change 11)*, United States Department of Transportation, Washington, D.C., August 9, 2001.

integration with airfield configuration and landside facilities, experiential, and adaptability to sustainability initiatives and other design qualities inherent in an option.

Compensatory Agreement—One of two commonly used airline/airport rate-setting methodologies whereby the airlines pay agreed-upon rates and charges based on the recovery of costs allocated to the facilities and services that they occupy or use.

Cost per Enplaned Passenger (CPE)—A standard financial evaluation metric, CPE is the calculated cost to the airlines for each enplaned passenger at the airport. Depending on airline/airport agreements, net costs include both terminal rents and landing fees, and are offset by various airport revenues, such as concession revenue.

Customer Facility Charge (CFC)—A charge imposed by an airport operator on customers of rental car companies at the airport based on terms and conditions of the airport operator set through state or municipal authorization.

Debt Service Coverage Ratios—The ratio of funds available to pay debt service each year to the required annual debt service payments. Required debt service coverage ratios are typically contained in the airport operator's bond enabling legislation.

Facility Condition Assessment (FCA)—Assessment technique that provides an inventory of the terminal spaces and utilities, as well as architectural, engineering, and special systems infrastructure with the expressed purpose of identifying deficiencies, projecting priority of repairs or replacements, and estimating the cost to correct deficiencies.

Facility Condition Index (FCI)—Stated as a percentage, this index measures the estimated cost of the current year deficiencies and compares it to the projected replacement cost of the terminal. The higher the FCI, the poorer the relative condition of the facility.

Gap Analysis—A framework used to collect and analyze data to compare existing conditions to required or desired conditions.

Letter of Intent (LOI)—A letter from the FAA reflecting its intent to fund an approved capital project as funding is available. Typically used in multiyear funding commitments, the FAA issues an LOI and awards the airport annual grants based on a defined schedule. An LOI is not a legal obligation to award funds; it reflects the FAA's intent only.

Life Cycle—The typical or expected life of a piece of equipment, system, or facility beyond which productivity, efficiency, or cost of repair becomes impractical.

Life-Cycle Cost—The total cost of purchasing, operating, and maintaining a system through its expected useful life.

Majority-in-Interest (MII)—The voting and approval processes defined in airport/airline agreements.

Million Annual Passengers (MAP)—Total annual passengers (in millions) who arrive or depart from the airport, including passengers who connect between flights. The count typically includes only passengers on commercial flights.

Origin and Destination (O&D)—Airline passengers who begin or end their trips at this airport as opposed to those passengers who are connecting from (or to) another flight.

Pay as You Go (PAYGO)—The use of PFC revenues to cover direct project expenses on a pay-as-you-go basis rather than using existing and expected PFC revenues to pay debt service on bonds issued for PFC-eligible projects.

Program Compliance Evaluation—An evaluation or analysis of results that compares facility requirements to functional and size elements of the options under consideration.

Public Space—Terminal spaces, such as corridors and restrooms, not rented to tenants and available to the public.

Rates and Charges—The various payments made by airlines to the airport for facilities used and services provided, most commonly landing fees and terminal rental rates, in accordance with the airport use and lease agreements.

Residual Agreement—One of two common airline/airport rate-setting methodologies, whereby the airlines pay the net costs of operating the airport after taking into account the commercial and other non-airline sources of revenue. The airlines (or signatory airlines) provide a guarantee that the level of rents and charges will be such that the airport enterprise can be operated in a break-even manner. In exchange for this guarantee, the signatory airlines typically have rights of approval over capital investment and other operating costs at the airport (see MII).

Return on Investment (ROI)—The profits (or benefits) associated with an investment relative to the cost of the investment.

Soft Costs—Costs related to a facility development that includes planning, design and engineering, and program management, plus contingencies to cover unknown changes and conditions.

Stakeholders—Individuals, groups, organizations, or other entities that have a significant interest in a common issue, event, or project.

Strategic Plan—A document that states a community's goals and objectives for its airport, including definitions of a mission and vision for its future (see ACRP Report 20).²

SWOT—A strategic framework applied to analyze the strengths, weaknesses, opportunities, and threats associated with a project or issue.

Terminal Area Forecast (TAF)—Forecasts of aviation activity prepared annually by the FAA.

Terminal Rentable Space—The total amount of rentable space in the terminal, including space leased and not leased to the airlines.

Trigger—As defined in this Guidebook, an action, condition, or activity level that creates a need to modify a terminal building or elements within the building.

Uniformat—A standard classification system for building elements and related sitework used in construction project management.

Useful Life—Similar to Life Cycle, the typical or expected life of a piece of equipment, system, or facility beyond which productivity, efficiency, or the cost of repair becomes impractical.

A.2 List of Acronyms

AAAE	American Association of Airport Executives
ACI-NA	Airports Council International-North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
ADG	Airplane Design Group
A4A	Airlines for America

²ACRP Report 20, *Strategic Planning in the Airport Industry*, Transportation Research Board, Washington, D.C., 2009.

AIP	Airport Improvement Program
BCA	Benefit/Cost Analysis
CATS	Compliance Activity Tracking System
CBP	U.S. Customs and Border Protection
CFC	Customer Facility Charge
CIP	Capital Improvement Program
CPE	Cost per Enplaned Passenger
FAA	Federal Aviation Administration
FCA	Facility Condition Assessment
FCI	Facility Condition Index
GARBs	General Airport Revenue Bonds
HVAC	Heating, ventilation, and air conditioning
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IT	Information Technology
LCCA	Life-Cycle Cost Analysis
LOI	Letter of Intent
MAP	Million annual passengers
MII	Majority-in-Interest
NPIAS	National Plan of Integrated Airport Systems
NPV	Net present value
O&D	Origin and destination
O&M	Operation and Maintenance
PFC	Passenger facility charge
PV	Present value
ROI	Return on Investment
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TAF	Terminal Area Forecast
TSA	Transportation Security Administration

Sample Case Data Tables

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Table B-1 (a)

Cost Estimate - Terminal Renewal Alternative

	Existing Inventory (SF)	Unit Cost (\$/SF)		Operating Space Required (SF)		Program Cost Renew
		Renew	Replace	Renew	Net New to Build	
Temporary Construction and Relocations:						
Construct 5 temp gates and ops space			\$250		30,000	\$7,500,000
Construct associated temp apron			15		250,000	3,750,000
Construct 10,000 SF Ticketing Lobby and support space			250		10,000	2,500,000
Relocate Airport Support Facility			200		22,500	4,500,000
Subtotal Temporary Construction and Relocations						\$20,350,000
Airline Leased Space:						
Preferential Leased						
Ticketing and Offices	15,000	\$300	\$700	15,000	-	\$4,500,000
Holdrooms	29,000	300	700	38,000	9,000	15,000,000
Operations	26,000	200	450	27,000	1,000	5,650,000
Bag Service Offices	4,000	200	450	4,000	-	800,000
Subtotal Preferential Leased	74,000			84,000	10,000	\$25,950,000
Joint Use Space						
Baggage Make-Up	33,000	\$200	\$450	35,000	2,000	\$7,500,000
Baggage Claim	25,000	300	700	29,000	4,000	10,300,000
Tug Drive	17,000	100	300	18,000	1,000	2,000,000
Subtotal Joint Use Space	75,000			82,000	7,000	\$19,800,000
Total Airline Leased Space	149,000			166,000	17,000	\$45,750,000
Building Space:						
Terminal Rentable space						
Airline Leased Space	149,000	\$200	\$450	166,000	17,000	\$37,450,000
Non-Airline Offices	10,000	200	450	10,000	-	2,000,000
Concessions	25,000	300	700	35,000	10,000	14,500,000
Vacant/Other Airline Space	25,000	200	450	28,000	3,000	6,350,000
Airport Administration	35,000	200	450	35,000	-	7,000,000
Total Rentable Space	244,000			274,000	30,000	\$67,300,000
Public	94,000	300	700	174,000	80,000	\$4,200,000
Mechanical / Electrical / Plumbing / Building Structure	38,000	200	450	50,000	12,000	13,000,000
Total Terminal Space	376,000			498,000	122,000	\$164,500,000
Additional Requirements:						
Outbound Bag System	Upgrade					\$500,000
In-Line Bag Screening	New					2,000,000
Bag Claim Units	Upgrade					500,000
Aircraft Apron (adjacent concourses)	Renew	\$15		200,000		3,000,000
Terminal Curbide (2 drop off lanes and sidewalks)	Upgrade	15		70,000		1,050,000
Extend Airport Loop Roadway						N/A
Total Additional Requirements						\$7,050,000
Subtotal Option 1 (Renew) Construction Cost						\$237,650,000
Phasing Costs for On-Going Operations (20%)						47,530,000
Planning (1%) & Design (10%)						26,141,500
Program Management (5%)						11,882,500
Contingency (15%)						41,351,100
Total Estimated Cost						\$364,555,100

Notes:

- 1/ N/A = Not Applicable
- 2/ Table corresponds to Table 9-3 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc., September 2011.
Prepared by: Ricondo & Associates, Inc., September 2011.

Table B-1 (b)**Cost Estimate - Terminal Replace Alternative**

		Replace		
	Existing Inventory (SF)	Unit Cost (\$/SF)	Space Required (SF)	Program Cost (\$)
Temporary Construction and Relocations:				
Construct 5 temp gates and ops space				N/A
Construct associated temp apron				N/A
Construct 10000 SF Ticketing Lobby and support space				N/A
Relocation and start up				N/A
Relocate Cargo Facility		\$300	50,000	\$15,000,000
Relocate Rental Car Lot				1,100,000
Relocate Airport Support Facility				N/A
Subtotal Temporary Construction and Relocations				\$16,100,000
Airline Leased Space:				
Preferential Leased				
Ticketing and Offices	15,000	\$550	15,000	\$8,250,000
Holdrooms	29,000	550	35,000	19,250,000
Operations	26,000	350	25,000	8,750,000
Bag Service Offices	4,000	350	4,000	1,400,000
Subtotal Preferential Leased	74,000		79,000	\$37,650,000
Joint Use Space				
Baggage Make-Up	33,000	\$350	34,000	\$11,900,000
Baggage Claim	25,000	550	28,000	15,400,000
Tug Drive	17,000	300	15,000	4,500,000
Subtotal Joint Use Space	75,000		77,000	\$31,800,000
Total Airline Leased Space	149,000		156,000	\$69,450,000
Building Space:				
Terminal Rentable space:				
Airline Leased Space	149,000	\$350	156,000	\$54,600,000
Non-Airline Offices	10,000	350	13,000	4,550,000
Concessions	25,000	550	45,000	24,750,000
Vacant/Other Airline Space	25,000	350	26,000	9,100,000
Airport Administration	35,000	350	40,000	14,000,000
Total Rentable Space	244,000		280,000	\$107,000,000
Public	94,000	\$550	135,000	\$74,250,000
Mechanical / Electrical / Plumbing / Building Structure	38,000	350	36,000	12,600,000
Total Building Space	376,000		451,000	\$193,850,000
Additional Requirements:				
Outbound Bag System				\$2,000,000
In-Line Bag Screening				2,000,000
Bag Claim Units				1,000,000
Aircraft Apron (adjacent concourses)		\$20	1,000,000	20,000,000
Terminal Curbside (2 drop off lanes and sidewalks)		20	75,000	1,500,000
Extend Airport Loop Roadway				1,200,000
Total Additional Requirements				\$27,700,000
Subtotal Option 2 (Replace) Construction Cost				\$307,100,000
Phasing Costs for On-Going Operations (10%)				30,710,000
Planning (1%) & Design (10%)				33,781,000
Program Management (5%)				15,355,000
Contingency (15%)				53,435,400
Total Estimated Cost				\$440,381,400

Notes:

1/ N/A = Not Applicable

2/ Table corresponds to Table 9-3 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc., September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

Table B-2 (a)

Timed Program Construction Expenditures - Terminal Renewal Alternative

	Program Cost (\$)	Planning / Construction Year							
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Temporary Construction and Relocations:									
Construct 5 temp gates and ops space	\$7,500,000	\$2,500,000	\$5,000,000						
Construct associated temp apron	3,750,000		3,750,000						
Construct 10,000 SF Ticketing Lobby and support space	2,500,000	750,000	1,750,000						
Relocation and start up	1,000,000		1,000,000						
Relocate Cargo Facility	N/A								
Relocate Rental Car Lot	1,100,000	100,000		\$1,000,000					
Relocate Airport Support Facility	4,500,000	1,500,000	3,000,000						
Option 1 - Renew Construction Cost									
Phasing Costs for On-Going Operations (20%)	\$217,300,000			43,460,000	\$43,460,000	\$21,730,000	\$43,460,000	\$43,460,000	\$21,730,000
Planning (1%) & Design (10%)	47,530,000			7,921,667	7,921,667	7,921,667	7,921,667	7,921,667	7,921,667
Program Management (5%)	26,141,500	13,070,750	13,070,750						
Contingency (15%)	11,882,500		1,697,500	1,697,500	1,697,500	1,697,500	1,697,500	1,697,500	1,697,500
	41,351,100		6,891,850	6,891,850	6,891,850	6,891,850	6,891,850	6,891,850	6,891,850
Total Annual Cash Flow (Current Year Dollars)	\$364,555,100	\$17,920,750	\$29,268,250	\$60,971,017	\$59,971,017	\$38,241,017	\$59,971,017	\$59,971,017	\$38,241,017
Total Annual Cash Flow (Nominal Dollars @ 3%)	\$409,486,751	\$17,920,750	\$30,146,298	\$64,684,152	\$65,531,949	\$43,040,601	\$69,522,845	\$71,608,530	\$47,031,627

Note:

1/ Table corresponds to Exhibit 9-2 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc., September 2011.
Prepared by: Ricondo & Associates, Inc., September 2011.

Table B-2 (b)

Timed Program Construction Expenditures - Terminal Replacement Alternative

	Program Cost (\$)	Planning / Construction Year							
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Temporary Construction and Relocations:									
Construct 5 temp gates and ops space	N/A								
Construct associated temp apron	N/A								
Construct 10,000 SF Ticketing Lobby and support space	N/A								
Relocation and start up	N/A								
Relocate Cargo Facility	\$15,000,000	\$5,000,000	\$10,000,000						
Relocate Rental Car Lot	1,100,000	100,000	1,000,000						
Relocate Airport Support Facility	N/A								
Option 1 - Renew Construction Cost	291,000,000			\$58,200,000	\$58,200,000	\$58,200,000	\$58,200,000	\$58,200,000	
Phasing Costs for On-Going Operations (20%)	30,710,000			5,118,333	5,118,333	5,118,333	5,118,333	5,118,333	\$5,118,333
Planning (1%) & Design (10%)	33,781,000	16,890,500	16,890,500						
Program Management (5%)	15,355,000		2,193,571	2,193,571	2,193,571	2,193,571	2,193,571	2,193,571	2,193,571
Contingency (15%)	53,435,400			8,905,900	8,905,900	8,905,900	8,905,900	8,905,900	8,905,900
Total Annual Cash Flow (Current Year Dollars)	\$440,381,400	\$21,990,500	\$30,084,071	\$74,417,805	\$74,417,805	\$74,417,805	\$74,417,805	\$74,417,805	\$16,217,805
Total Annual Cash Flow (Nominal Dollars @ 3%)	\$492,078,419	\$21,990,500	\$30,986,594	\$78,949,849	\$81,318,345	\$83,757,895	\$86,270,632	\$88,858,751	\$19,945,854

Notes:

- 1/ Table corresponds to Exhibit 9-2 within Chapter 9 of the Guidebook.
N/A = Not Applicable

Source: Ricondo & Associates, Inc., September 2011.
Prepared by: Ricondo & Associates, Inc., September 2011.

Table B-3

City Airport - Aviation Activity Projections

		Projected									
Current Year		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Enplanements											
Signatory Enplanements		2,800,000	2,927,000	2,993,000	3,060,000	3,129,000	3,199,000	3,271,000	3,345,000	3,420,000	3,497,000
Nonsignatory Enplanements		200,000	210,000	215,000	220,000	225,000	230,000	235,000	240,000	245,000	251,000
Other		0	0	0	0	0	0	0	0	0	0
Total Annual Enplanements		3,000,000	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,665,000	3,748,000
Operations											
Air Carrier		50,000	52,000	53,000	54,000	55,000	56,000	57,000	58,000	59,000	60,000
General Aviation		30,000	32,000	33,000	34,000	35,000	36,000	37,000	38,000	39,000	40,000
Air Taxi/Commuter		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Military		0	0	0	0	0	0	0	0	0	0
Total Operations		90,000	94,000	96,000	98,000	100,000	102,000	104,000	106,000	108,000	110,000
Landed Weight											
Signatory Landed Weight		3,920,000	4,078,000	4,160,000	4,243,000	4,328,000	4,415,000	4,503,000	4,593,000	4,685,000	4,779,000
Nonsignatory Landed Weight		280,000	292,000	298,000	304,000	310,000	316,000	322,000	328,000	335,000	342,000
Other Landed Weight		0	0	0	0	0	0	0	0	0	0
Total Landed Weight		4,200,000	4,370,000	4,458,000	4,547,000	4,638,000	4,731,000	4,825,000	4,921,000	5,020,000	5,121,000

Note:

1/ Table corresponds to Exhibit 9-4 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-4 (a)

Terminal Space (SF) - Terminal Renewal Alternative

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Airline Space:											
Exclusive Use Space											
Ticketing and Offices	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Holdrooms	29,000	29,000	29,000	29,000	33,500	33,500	33,500	33,500	38,000	38,000	38,000
Operations	26,000	26,000	26,000	26,000	26,500	26,500	26,500	26,500	27,000	27,000	27,000
Bag service offices	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Total Leased Exclusive Use Space	74,000	74,000	74,000	74,000	79,000	79,000	79,000	79,000	84,000	84,000	84,000
Joint Use Space											
Baggage Make-Up	33,000	33,000	33,000	33,000	34,000	34,000	34,000	34,000	35,000	35,000	35,000
Baggage Claim	25,000	25,000	25,000	25,000	27,000	27,000	27,000	27,000	29,000	29,000	29,000
Tug Drive	17,000	17,000	17,000	17,000	17,500	17,500	17,500	17,500	18,000	18,000	18,000
Total Joint Use Space	75,000	75,000	75,000	75,000	78,500	78,500	78,500	78,500	82,000	82,000	82,000
Total Airline Leased Space	149,000	149,000	149,000	149,000	157,500	157,500	157,500	157,500	166,000	166,000	166,000
Other Airline Rentable Space											
Ticketing and Offices	4,000	4,000	4,000	4,000	4,250	4,250	4,250	4,250	4,500	4,500	4,500
Holdrooms	11,000	11,000	11,000	11,000	11,500	11,500	11,500	11,500	12,000	12,000	12,000
Operations	9,000	9,000	9,000	9,000	9,500	9,500	9,500	9,500	10,000	10,000	10,000
Bag service offices	1,000	1,000	1,000	1,000	1,250	1,250	1,250	1,250	1,500	1,500	1,500
Other Airline Rentable Space	25,000	25,000	25,000	25,000	26,500	26,500	26,500	26,500	28,000	28,000	28,000
Total Airline Rentable Space	174,000	174,000	174,000	174,000	184,000	184,000	184,000	184,000	194,000	194,000	194,000
Terminal Rentable Space											
Airline Rentable Space	174,000	174,000	174,000	174,000	184,000	184,000	184,000	184,000	194,000	194,000	194,000
Non-Airline Offices	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Concessions	25,000	25,000	25,000	25,000	30,000	30,000	30,000	30,000	35,000	35,000	35,000
Airport Administration	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000
Total Terminal Rentable Space	244,000	244,000	244,000	244,000	259,000	259,000	259,000	259,000	274,000	274,000	274,000
Public	94,000	94,000	94,000	94,000	134,000	134,000	134,000	134,000	174,000	174,000	174,000
Total Useable Space	338,000	338,000	338,000	338,000	393,000	393,000	393,000	393,000	448,000	448,000	448,000
Mechanical & Service	38,000	38,000	38,000	38,000	44,000	44,000	44,000	44,000	50,000	50,000	50,000
Total Terminal Space	376,000	376,000	376,000	376,000	437,000	437,000	437,000	437,000	498,000	498,000	498,000

Notes:

- 1/ Years 5 and 8 mark the incremental space impacts of the assumed terminal project alternative.
- 2/ Table corresponds to Exhibit 9-5 within Chapter 9 of the Guidebook.

Table B-4 (b)

Terminal Space (SF) - Terminal Replacement Alternative

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Airline Space:											
Exclusive Use Space											
Ticketing and Offices	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Holdrooms	29,000	29,000	29,000	29,000	33,960	33,960	33,960	33,960	35,000	35,000	35,000
Operations	26,000	26,000	26,000	26,000	25,173	25,173	25,173	25,173	25,000	25,000	25,000
Bag service offices	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Total Leased Exclusive Use Space	74,000	74,000	74,000	74,000	78,133	78,133	78,133	78,133	79,000	79,000	79,000
Joint Use Space											
Baggage Make-Up	33,000	33,000	33,000	33,000	33,827	33,827	33,827	33,827	34,000	34,000	34,000
Baggage Claim	25,000	25,000	25,000	25,000	27,480	27,480	27,480	27,480	28,000	28,000	28,000
Tug Drive	17,000	17,000	17,000	17,000	15,347	15,347	15,347	15,347	15,000	15,000	15,000
Total Joint Use Space	75,000	75,000	75,000	75,000	76,653	76,653	76,653	76,653	77,000	77,000	77,000
Total Airline Leased Space	149,000	149,000	149,000	149,000	154,787	154,787	154,787	154,787	156,000	156,000	156,000
Other Airline Rentable Space											
Ticketing and Offices	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Holdrooms	11,000	11,000	11,000	11,000	11,827	11,827	11,827	11,827	12,000	12,000	12,000
Operations	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Bag service offices	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Other Airline Rentable Space	25,000	25,000	25,000	25,000	25,827	25,827	25,827	25,827	26,000	26,000	26,000
Total Airline Rentable Space	174,000	174,000	174,000	174,000	180,613	180,613	180,613	180,613	182,000	182,000	182,000
Terminal Rentable Space											
Airline Rentable Space	174,000	174,000	174,000	174,000	180,613	180,613	180,613	180,613	182,000	182,000	182,000
Non-Airline Offices	10,000	10,000	10,000	10,000	12,480	12,480	12,480	12,480	13,000	13,000	13,000
Concessions	25,000	25,000	25,000	25,000	41,533	41,533	41,533	41,533	45,000	45,000	45,000
Airport Administration	35,000	35,000	35,000	35,000	39,133	39,133	39,133	39,133	40,000	40,000	40,000
Total Terminal Rentable Space	244,000	244,000	244,000	244,000	273,760	273,760	273,760	273,760	280,000	280,000	280,000
Public											
	94,000	94,000	94,000	94,000	127,893	127,893	127,893	127,893	135,000	135,000	135,000
Total Useable Space	338,000	338,000	338,000	338,000	401,653	401,653	401,653	401,653	415,000	415,000	415,000
Mechanical & Service											
	38,000	38,000	38,000	38,000	36,347	36,347	36,347	36,347	36,000	36,000	36,000
Total Terminal Space	376,000	376,000	376,000	376,000	438,000	438,000	438,000	438,000	451,000	451,000	451,000

Notes:

- 1/ Years 5 and 8 mark the incremental space impacts of the assumed terminal project alternative.
- 2/ Table corresponds to Exhibit 9-5 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-5 (a)**Summary of CIP - Total Cost by Fiscal Year and Funding Source - Terminal Renewal Alternative**

Capital Improvement Plan:	Current Year	Projected										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
CIP Project Costs	\$4,000,000	\$4,120,000	\$4,243,600	\$4,370,908	\$4,502,035	\$4,637,096	\$4,776,209	\$4,919,495	\$5,067,080	\$5,219,093	\$5,375,666	\$51,231,183
Terminal Project Costs		17,920,750	30,146,298	64,684,152	65,531,949	43,040,601	69,522,845	71,608,530	47,031,627			409,486,751
Total Project Costs	\$4,000,000	\$22,040,750	\$34,389,898	\$69,055,060	\$70,033,984	\$47,677,697	\$74,299,054	\$76,528,026	\$52,098,707	\$5,219,093	\$5,375,666	\$460,717,934
Total Cost by Funding Source:												
AIP Entitlements	\$1,507,500	\$1,524,500	\$1,541,750	\$1,559,500	\$1,577,500	\$1,596,000	\$1,614,750	\$1,634,000	\$1,653,750	\$1,673,750	\$1,694,500	\$17,577,500
AIP Discretionary PFC PAYGO - Terminal		13,440,563	22,609,723	4,800,000	4,900,000	3,200,000	5,200,000	5,400,000	3,500,000			27,000,000 36,050,286
PFC PAYGO - CIP	2,000,000	2,080,000	2,163,200	2,249,728	2,339,717	2,433,306	2,530,638	2,000,000	2,000,000	2,000,000		23,796,589
GARBs - First Issue				54,884,152	48,231,949	38,840,601	63,522,845	63,708,530	40,531,627			141,956,702
GARBs - Second Issue												167,763,002
Local Cash - Terminal		4,480,188	7,536,574	5,000,000	12,400,000	1,000,000	800,000	2,500,000	3,000,000			36,716,762
Local Cash - CIP	492,500	515,500	538,650	561,680	584,818	607,790	630,821	1,285,495	1,413,330	1,545,343	1,681,166	9,857,094
Total	\$4,000,000	\$22,040,750	\$34,389,898	\$69,055,060	\$70,033,984	\$47,677,697	\$74,299,054	\$76,528,026	\$52,098,707	\$5,219,093	\$5,375,666	\$460,717,934

Note:

1/ Table corresponds to Exhibit 9-7 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-5 (b)**Summary of CIP - Total Cost by Fiscal Year And Funding Source - Terminal Replacement Alternative**

Capital Improvement Plan:	Current Year	Projected										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
CIP Project Costs	\$4,000,000	\$4,120,000	\$4,243,600	\$4,370,908	\$4,502,035	\$4,637,096	\$4,776,209	\$4,919,495	\$5,067,080	\$5,219,093	\$5,375,666	\$51,231,183
Terminal Project Costs	0	21,990,500	30,986,594	78,949,849	81,318,345	83,757,895	86,270,632	88,858,751	19,945,854			492,078,419
Total Project Costs	\$4,000,000	\$26,110,500	\$35,230,194	\$83,320,757	\$85,820,380	\$88,394,991	\$91,046,841	\$93,778,246	\$25,012,935	\$5,219,093	\$5,375,666	\$543,309,601
Total Cost by Funding Source:												
AIP Entitlements	\$1,507,500	\$1,524,500	\$1,541,750	\$1,559,500	\$1,577,500	\$1,596,000	\$1,614,750	\$1,634,000	\$1,653,750	\$1,673,750	\$1,694,500	\$17,577,500
AIP Discretionary				6,300,000	6,500,000	7,600,000	7,800,000	8,100,000				36,300,000
PFC PAYGO - Terminal		16,492,875	23,239,945	4,000,000	2,000,000							45,732,820
PFC PAYGO - CIP	2,000,000	2,080,000	2,163,200	2,249,728	2,339,717	2,433,306	2,530,638	2,000,000	2,000,000	2,000,000		23,796,589
GARBs - First Issue				67,649,849	61,818,345	71,157,895						200,626,088
GARBs - Second Issue							75,470,632	78,258,751	19,945,854			173,675,237
Local Cash - Terminal		5,497,625	7,746,648	1,000,000	11,000,000	5,000,000	3,000,000	2,500,000				35,744,273
Local Cash - CIP	492,500	515,500	538,650	561,680	584,818	607,790	630,821	1,285,495	1,413,330	1,545,343	1,681,166	9,857,094
Total	\$4,000,000	\$26,110,500	\$35,230,194	\$83,320,757	\$85,820,380	\$88,394,991	\$91,046,841	\$93,778,246	\$25,012,935	\$5,219,093	\$5,375,666	\$543,309,601

Note:

1/ Table corresponds to Exhibit 9-7 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc. September 2011

Table B-6 (a)

Operation & Maintenance Expenses - Terminal Renewal Alternative

By Category:	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Wages	\$15,000,000	\$15,750,000	\$16,538,000	\$17,365,000	\$18,233,000	\$19,145,000	\$20,102,000	\$21,107,000	\$22,162,000	\$23,270,000	\$24,434,000
Fringe Benefits	4,500,000	4,725,000	4,961,400	5,209,500	5,469,900	5,743,500	6,030,600	6,332,100	6,648,600	6,981,000	7,330,200
Other Expenses	1,000,000	1,030,000	1,061,000	1,093,000	1,126,000	1,160,000	1,195,000	1,231,000	1,268,000	1,306,000	1,345,000
Contracted Services	12,000,000	12,360,000	12,731,000	13,113,000	13,506,000	13,911,000	14,328,000	14,758,000	15,201,000	15,657,000	16,127,000
Repair & Maintenance	3,000,000	3,120,000	3,245,000	3,375,000	3,510,000	3,650,000	3,796,000	3,948,000	4,106,000	4,270,000	4,441,000
Insurance	1,000,000	1,030,000	1,061,000	1,093,000	1,126,000	1,160,000	1,195,000	1,231,000	1,268,000	1,306,000	1,345,000
Utilities	3,000,000	3,120,000	3,245,000	3,375,000	3,510,000	3,650,000	3,796,000	3,948,000	4,106,000	4,270,000	4,441,000
Education & Travel	500,000	515,000	530,000	546,000	562,000	579,000	596,000	614,000	632,000	651,000	671,000
Professional Services	2,500,000	2,600,000	2,704,000	2,812,000	2,924,000	3,041,000	3,163,000	3,290,000	3,422,000	3,559,000	3,701,000
Office Supplies	1,000,000	1,030,000	1,061,000	1,093,000	1,126,000	1,160,000	1,195,000	1,231,000	1,268,000	1,306,000	1,345,000
Incremental Terminal Expenses						2,000,000	2,060,000	2,122,000	5,186,000	5,342,000	5,502,000
Total O&M Expenses	\$43,500,000	\$45,280,000	\$47,137,400	\$49,074,500	\$51,092,900	\$55,199,500	\$57,456,600	\$59,812,100	\$65,267,600	\$67,918,000	\$70,682,200
By Cost Center (fully allocated):											
Airfield Area	\$10,875,000	\$11,320,000	\$11,784,350	\$12,268,625	\$12,773,225	\$13,299,875	\$13,849,150	\$14,422,525	\$15,020,400	\$15,644,000	\$16,295,050
Terminal Building ^{1/}	19,575,000	20,376,000	21,211,830	22,083,525	22,991,805	25,939,775	26,988,470	28,082,545	32,222,720	33,501,200	34,833,090
Other Buildings and Areas	13,050,000	13,584,000	14,141,220	14,722,350	15,327,870	15,959,850	16,618,980	17,307,030	18,024,480	18,772,800	19,554,060
Total O&M Expenses	\$43,500,000	\$45,280,000	\$47,137,400	\$49,074,500	\$51,092,900	\$55,199,500	\$57,456,600	\$59,812,100	\$65,267,600	\$67,918,000	\$70,682,200

Notes:

- 1/ Years 5 and 8 mark the incremental O&M expense impacts of the assumed terminal project alternative.
- 2/ Table corresponds to Exhibit 9-8 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-6 (b)

Operation & Maintenance Expenses - Terminal Replacement Alternative

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
By Category:											
Wages	\$15,000,000	\$15,750,000	\$16,538,000	\$17,385,000	\$18,233,000	\$19,145,000	\$20,102,000	\$21,107,000	\$22,162,000	\$23,270,000	\$24,434,000
Fringe Benefits	4,500,000	4,725,000	4,961,400	5,209,500	5,469,900	5,743,500	6,030,600	6,332,100	6,648,600	6,981,000	7,330,200
Other Expenses	1,000,000	1,030,000	1,061,000	1,093,000	1,126,000	1,160,000	1,195,000	1,231,000	1,268,000	1,306,000	1,345,000
Contracted Services	12,000,000	12,360,000	12,731,000	13,113,000	13,506,000	13,911,000	14,328,000	14,758,000	15,201,000	15,657,000	16,127,000
Repair & Maintenance	3,000,000	3,120,000	3,245,000	3,375,000	3,510,000	3,650,000	3,796,000	3,948,000	4,106,000	4,270,000	4,441,000
Insurance	1,000,000	1,030,000	1,061,000	1,093,000	1,126,000	1,160,000	1,195,000	1,231,000	1,268,000	1,306,000	1,345,000
Utilities	3,000,000	3,120,000	3,245,000	3,375,000	3,510,000	3,650,000	3,796,000	3,948,000	4,106,000	4,270,000	4,441,000
Education & Travel	500,000	515,000	530,000	546,000	562,000	579,000	596,000	614,000	632,000	651,000	671,000
Professional Services	2,500,000	2,600,000	2,704,000	2,812,000	2,924,000	3,041,000	3,163,000	3,290,000	3,422,000	3,559,000	3,701,000
Office Supplies	1,000,000	1,030,000	1,061,000	1,093,000	1,126,000	1,160,000	1,195,000	1,231,000	1,268,000	1,306,000	1,345,000
Incremental Terminal Expenses	0	0	0	0	0	1,000,000	1,030,000	1,061,000	1,500,000	1,545,000	1,591,000
Total O&M Expenses	\$43,500,000	\$45,280,000	\$47,137,400	\$49,074,500	\$51,092,900	\$54,199,500	\$56,426,600	\$58,751,100	\$61,581,600	\$64,121,000	\$66,771,200
By Cost Center (fully allocated):											
Airfield Area	\$10,875,000	\$11,320,000	\$11,784,350	\$12,268,625	\$12,773,225	\$13,299,875	\$13,849,150	\$14,422,525	\$15,020,400	\$15,644,000	\$16,295,050
Terminal Building ^{1/}	19,575,000	20,376,000	21,211,830	22,083,525	22,991,805	24,939,775	25,958,470	27,021,545	28,536,720	29,704,200	30,922,090
Other Buildings and Areas	13,050,000	13,584,000	14,141,220	14,722,350	15,327,870	15,959,850	16,618,980	17,307,030	18,024,480	18,772,800	19,554,060
Total O&M Expenses	\$43,500,000	\$45,280,000	\$47,137,400	\$49,074,500	\$51,092,900	\$54,199,500	\$56,426,600	\$58,751,100	\$61,581,600	\$64,121,000	\$66,771,200

Notes:

- 1/ Years 5 and 8 mark the incremental O&M expense impacts of the assumed terminal project alternative.
- 2/ Table corresponds to Exhibit 9-8 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-7 (a)

Non-Airline Revenue - Terminal Renewal Alternative

	Current Year	Projected										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Airfield Non-Airline Revenue:												
FBO Revenue	\$2,000,000	\$2,075,000	\$2,121,000	\$2,169,000	\$2,218,000	\$2,268,000	\$2,319,000	\$2,371,000	\$2,425,000	\$2,479,000	\$2,535,000	\$24,980,000
Cargo and Hangar Rentals	1,500,000	1,523,000	1,546,000	1,569,000	1,593,000	1,617,000	1,641,000	1,666,000	1,691,000	1,716,000	1,742,000	17,804,000
Fuel Flowage Fees	500,000	519,000	531,000	543,000	555,000	568,000	581,000	594,000	607,000	621,000	635,000	6,254,000
Total Airfield Non-Airline Revenue	\$4,000,000	\$4,117,000	\$4,198,000	\$4,281,000	\$4,366,000	\$4,453,000	\$4,541,000	\$4,631,000	\$4,723,000	\$4,816,000	\$4,912,000	\$49,038,000
Terminal Non-Airline Revenue:												
Restaurants	\$1,800,000	\$1,868,000	\$1,938,000	\$2,011,000	\$2,086,000	\$2,327,000	\$2,414,000	\$2,505,000	\$2,794,000	\$2,899,000	\$3,008,000	\$25,650,000
News and Gifts	1,700,000	1,764,000	1,830,000	1,899,000	1,970,000	2,197,000	2,279,000	2,364,000	2,637,000	2,736,000	2,839,000	24,215,000
Other Concessions	100,000	104,000	108,000	112,000	116,000	129,000	134,000	139,000	155,000	161,000	167,000	1,425,000
Advertising	200,000	208,000	216,000	224,000	232,000	259,000	269,000	279,000	311,000	323,000	335,000	2,856,000
Other	100,000	104,000	108,000	112,000	116,000	129,000	134,000	139,000	155,000	161,000	167,000	1,425,000
Non-Airline Space Rentals	400,000	406,000	412,000	418,000	424,000	430,000	436,000	443,000	450,000	457,000	464,000	4,740,000
Total Terminal Building	\$4,300,000	\$4,454,000	\$4,612,000	\$4,776,000	\$4,944,000	\$5,471,000	\$5,666,000	\$5,869,000	\$6,502,000	\$6,737,000	\$6,980,000	\$60,311,000
Other Areas Non-Airline Revenue:												
Parking	\$16,000,000	\$16,600,000	\$17,220,000	\$17,867,000	\$18,535,000	\$19,231,000	\$19,950,000	\$20,698,000	\$21,477,000	\$22,281,000	\$23,117,000	\$212,976,000
Rental Cars	8,000,000	8,300,000	8,610,000	8,933,000	9,267,000	9,615,000	9,974,000	10,348,000	10,737,000	11,139,000	11,557,000	106,480,000
Ground Transportation	1,000,000	1,038,000	1,077,000	1,117,000	1,159,000	1,203,000	1,248,000	1,295,000	1,344,000	1,394,000	1,446,000	13,321,000
Total Other Areas Non-Airline Revenue	\$25,000,000	\$25,938,000	\$26,907,000	\$27,917,000	\$28,961,000	\$30,049,000	\$31,172,000	\$32,341,000	\$33,558,000	\$34,814,000	\$36,120,000	\$332,777,000
Total Airport Non-Airline Operating Revenue												
	\$33,300,000	\$34,509,000	\$35,717,000	\$36,974,000	\$38,271,000	\$39,973,000	\$41,379,000	\$42,841,000	\$44,783,000	\$46,367,000	\$48,012,000	\$442,126,000
Non-Operating Revenue:												
Interest Income (Non-PFC):	\$1,309,000	\$1,347,650	\$1,296,636	\$1,184,419	\$1,122,871	\$1,181,266	\$1,276,643	\$1,339,313	\$1,673,380	\$1,692,391	\$2,340,736	\$15,764,305
Total Non-Airline Revenue	\$34,609,000	\$35,856,650	\$37,013,636	\$38,158,419	\$39,393,871	\$41,154,266	\$42,655,643	\$44,180,313	\$46,456,380	\$48,059,391	\$50,352,736	\$457,890,305

Notes:

- Years 5 and 8 mark the incremental non-airline revenue impacts of the assumed terminal project alternative.
- Table corresponds to Exhibit 9-9 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-7 (b)

Non-Airline Revenue - Terminal Replacement Alternative

	Current Year	Projected										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Airfield Non-Airline Revenue:												
FBO Revenue	\$2,000,000	\$2,075,000	\$2,121,000	\$2,169,000	\$2,218,000	\$2,268,000	\$2,319,000	\$2,371,000	\$2,425,000	\$2,479,000	\$2,535,000	\$24,980,000
Cargo and Hangar Rentals	1,500,000	1,523,000	1,546,000	1,569,000	1,593,000	1,617,000	1,641,000	1,666,000	1,691,000	1,716,000	1,742,000	17,804,000
Fuel Flowage Fees	500,000	519,000	531,000	543,000	555,000	568,000	581,000	594,000	607,000	621,000	635,000	6,254,000
Total Airfield Non-Airline Revenue	\$4,000,000	\$4,117,000	\$4,198,000	\$4,281,000	\$4,366,000	\$4,453,000	\$4,541,000	\$4,631,000	\$4,723,000	\$4,816,000	\$4,912,000	\$49,038,000
Terminal Non-Airline Revenue:												
Restaurants	\$1,800,000	\$1,868,000	\$1,938,000	\$2,011,000	\$2,086,000	\$2,161,000	\$2,236,000	\$2,311,000	\$2,386,000	\$2,461,000	\$2,536,000	\$26,814,000
News and Gifts	1,700,000	1,764,000	1,830,000	1,899,000	1,970,000	2,041,000	2,112,000	2,183,000	2,254,000	2,325,000	2,396,000	25,313,000
Other Concessions	100,000	104,000	108,000	112,000	116,000	120,000	124,000	128,000	132,000	136,000	140,000	1,486,000
Advertising	200,000	208,000	216,000	224,000	232,000	240,000	248,000	256,000	264,000	272,000	280,000	2,986,000
Other	100,000	104,000	108,000	112,000	116,000	120,000	124,000	128,000	132,000	136,000	140,000	1,486,000
Non-Airline Space Rentals	400,000	406,000	412,000	418,000	424,000	430,000	436,000	442,000	448,000	454,000	460,000	5,531,000
Total Terminal Building	\$4,300,000	\$4,454,000	\$4,612,000	\$4,776,000	\$4,944,000	\$5,112,000	\$5,280,000	\$5,448,000	\$5,616,000	\$5,784,000	\$5,952,000	\$63,616,000
Other Areas Non-Airline Revenue:												
Parking	\$16,000,000	\$17,220,000	\$17,867,000	\$18,535,000	\$19,231,000	\$19,950,000	\$20,698,000	\$21,477,000	\$22,281,000	\$23,117,000	\$23,979,000	\$212,976,000
Rental Cars	8,000,000	8,300,000	8,610,000	8,933,000	9,267,000	9,615,000	9,974,000	10,348,000	10,737,000	11,139,000	11,557,000	106,480,000
Ground Transportation	1,000,000	1,038,000	1,077,000	1,117,000	1,159,000	1,203,000	1,248,000	1,295,000	1,344,000	1,394,000	1,446,000	13,321,000
Total Other Areas Non-Airline Revenue	\$25,000,000	\$25,938,000	\$26,907,000	\$27,917,000	\$28,961,000	\$30,049,000	\$31,172,000	\$32,341,000	\$33,558,000	\$34,814,000	\$36,120,000	\$332,777,000
Total Airport Non-Airline Operating Revenue	\$33,300,000	\$34,509,000	\$35,717,000	\$36,974,000	\$38,271,000	\$40,272,000	\$41,687,000	\$43,186,000	\$45,535,000	\$47,155,000	\$48,825,000	\$445,431,000
Non-Operating Revenue:												
Interest Income (Non-PFC):	\$1,309,000	\$1,347,650	\$1,276,288	\$1,159,869	\$1,178,320	\$1,374,716	\$1,432,593	\$1,451,112	\$1,467,025	\$1,942,911	\$2,004,701	\$15,944,185
Total Non-Airline Revenue	\$34,609,000	\$35,856,650	\$36,993,288	\$38,133,869	\$39,449,320	\$41,646,716	\$43,119,593	\$44,637,112	\$47,002,025	\$49,097,911	\$50,829,701	\$461,375,185

Notes:

- Years 5 and 8 mark the incremental non-airline revenue impacts of the assumed terminal project alternative.
- Table corresponds to Exhibit 9-9 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-8 (a)

Debt Service - Terminal Renewal Alternative

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
GARBs:											
Existing GARB Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000
Terminal Project GARB Debt Service					18,900,000	18,900,000	18,900,000	18,900,000	35,300,000	35,300,000	35,300,000
Total GARB Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$22,900,000	\$22,900,000	\$22,900,000	\$22,900,000	\$39,300,000	\$39,300,000	\$39,300,000
Less: PFCs Applied to GARB Debt Service	0	0	0	0	17,300,000	13,950,000	13,400,000	13,400,000	26,900,000	21,300,000	20,300,000
Net GARB Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$5,600,000	\$8,950,000	\$9,500,000	\$9,500,000	\$12,400,000	\$18,000,000	\$19,000,000
PFC Bonds:											
Total PFC Bond Debt Service	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Total Debt Service	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$23,900,000	\$23,900,000	\$23,900,000	\$23,900,000	\$40,300,000	\$40,300,000	\$40,300,000
GARB Debt Service by Cost Center:											
Airfield Area	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000
Terminal Area	2,000,000	2,000,000	2,000,000	2,000,000	20,900,000	20,900,000	20,900,000	20,900,000	37,300,000	37,300,000	37,300,000
Other Areas	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Total Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$22,900,000	\$22,900,000	\$22,900,000	\$22,900,000	\$39,300,000	\$39,300,000	\$39,300,000

Notes:

- 1/ Years 5 and 8 mark the incremental non-airline revenue impacts of the assumed terminal project alternative.
- 2/ Table corresponds to Exhibit 9-10 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-8 (b)

Debt Service - Terminal Replacement Alternative

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
GARBS:											
Existing GARB Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000
Terminal Project GARB Debt Service					13,400,000	13,400,000	13,400,000	13,400,000	29,300,000	29,300,000	29,300,000
Total GARB Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$17,400,000	\$17,400,000	\$17,400,000	\$17,400,000	\$33,300,000	\$33,300,000	\$33,300,000
Less: PFCs Applied to GARB Debt Service	0	0	0	0	14,900,000	12,600,000	12,200,000	12,200,000	30,800,000	25,500,000	24,300,000
Net GARB Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$2,500,000	\$4,800,000	\$5,200,000	\$5,200,000	\$2,500,000	\$7,800,000	\$9,000,000
PFC Bonds:											
Total PFC Bond Debt Service	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Total Debt Service	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$18,400,000	\$18,400,000	\$18,400,000	\$18,400,000	\$34,300,000	\$34,300,000	\$34,300,000
GARB Debt Service by Cost Center:											
Airfield Area	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000
Terminal Area	2,000,000	2,000,000	2,000,000	2,000,000	15,400,000	15,400,000	15,400,000	15,400,000	31,300,000	31,300,000	31,300,000
Other Areas	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Total Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$17,400,000	\$17,400,000	\$17,400,000	\$17,400,000	\$33,300,000	\$33,300,000	\$33,300,000

Notes:

- 1/ Years 5 and 8 mark the incremental non-airline revenue impacts of the assumed terminal project alternative.
- 2/ Table corresponds to Exhibit 9-10 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-9 (a)

Terminal Rental Rate (Cost Center Residual Example) - Terminal Renewal Alternative

Fiscal Year Ending:	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Terminal Debt Service	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$15,400,000	\$15,400,000	\$15,400,000	\$31,300,000	\$31,300,000	\$31,300,000
Terminal Debt Service Coverage (1.25x)	500,000	500,000	500,000	500,000	500,000	3,850,000	3,850,000	3,850,000	7,825,000	7,825,000	7,825,000
Terminal Operating Expenses	19,575,000	20,376,000	21,211,830	22,083,525	22,991,805	25,939,775	26,988,470	28,082,545	32,222,720	33,501,200	34,833,090
Terminal Operating Expense Reserve	200,000	200,250	208,958	217,924	227,070	736,993	262,174	273,519	1,035,044	319,620	332,973
Total Requirement	\$22,275,000	\$23,076,250	\$23,920,788	\$24,801,449	\$25,718,875	\$45,926,768	\$46,500,644	\$47,606,064	\$72,382,764	\$72,945,820	\$74,291,063
Less:											
Terminal Non-Airline Revenues	(\$4,300,000)	(\$4,454,000)	(\$4,612,000)	(\$4,776,000)	(\$4,944,000)	(\$5,471,000)	(\$5,666,000)	(\$5,869,000)	(\$6,502,000)	(\$6,737,000)	(\$6,980,000)
Terminal Rental Rate Revenue Credit	(9,934,000)	(10,388,150)	(10,723,111)	(11,033,786)	(11,404,621)	(11,912,421)	(10,464,881)	(11,001,270)	(11,827,538)	(12,346,511)	(13,511,361)
Prior Year Debt Service Coverage Credit	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(3,850,000)	(3,850,000)	(3,850,000)	(7,825,000)	(7,825,000)
Non-Signatory Terminal Fees	(618,115)	(637,008)	(665,462)	(699,666)	(731,430)	(1,083,958)	(1,147,836)	(1,210,170)	(1,596,973)	(1,687,904)	(1,784,540)
PFCs Applied to Debt Service						(14,900,000)	(12,600,000)	(12,200,000)	(30,800,000)	(25,500,000)	(24,300,000)
Net Signatory Requirement	\$6,922,885	\$7,117,092	\$7,420,215	\$7,791,997	\$8,138,824	\$12,059,389	\$12,771,926	\$13,475,624	\$17,806,253	\$18,849,405	\$19,890,161
Total Leased Space	149,000	149,000	149,000	149,000	149,000	157,500	157,500	157,500	166,000	166,000	166,000
Signatory Terminal Rental Rate	\$46.46	\$47.77	\$49.80	\$52.30	\$54.62	\$76.57	\$81.09	\$85.56	\$107.27	\$113.55	\$119.82
Signatory Terminal Rental Revenue	\$6,922,885	\$7,117,092	\$7,420,215	\$7,791,997	\$8,138,824	\$12,059,389	\$12,771,926	\$13,475,624	\$17,806,253	\$18,849,405	\$19,890,161
Non-Signatory Terminal Rental Revenue	618,115	637,008	665,462	699,666	731,430	1,083,958	1,147,836	1,210,170	1,596,973	1,687,904	1,784,540
Total Terminal Rental Revenue	\$7,541,000	\$7,754,100	\$8,085,676	\$8,491,662	\$8,870,254	\$13,143,346	\$13,919,763	\$14,685,794	\$19,403,226	\$20,537,309	\$21,674,701

Notes:

- 1/ Years 5 and 8 mark the incremental non-airline revenue impacts of the assumed terminal project alternative.
- 2/ Table corresponds to Exhibit 9-11 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-9 (b)

Terminal Rental Rate (Cost Center Residual Example) - Terminal Replacement Alternative

Fiscal Year Ending:	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Terminal Debt Service	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$20,900,000	\$20,900,000	\$20,900,000	\$37,300,000	\$37,300,000	\$37,300,000
Terminal Debt Service Coverage (1.25x)	500,000	500,000	500,000	500,000	500,000	5,225,000	5,225,000	5,225,000	9,325,000	9,325,000	9,325,000
Terminal Operating Expenses	19,575,000	20,376,000	21,211,830	22,083,525	22,991,805	24,939,775	25,958,470	27,021,545	28,536,720	29,704,200	30,922,090
Terminal Operating Expense Reserve	200,000	200,250	208,958	217,924	227,070	486,993	254,674	265,769	378,794	291,870	304,473
Total Requirement	\$22,275,000	\$23,076,250	\$23,920,788	\$24,801,449	\$25,718,875	\$51,551,768	\$52,338,144	\$53,412,314	\$75,540,514	\$76,621,070	\$77,851,563
Less:											
Terminal Non-Airline Revenues	(\$4,300,000)	(\$4,454,000)	(\$4,612,000)	(\$4,776,000)	(\$4,944,000)	(\$5,770,000)	(\$5,974,000)	(\$6,214,000)	(\$7,254,000)	(\$7,525,000)	(\$7,793,000)
Terminal Rental Rate Revenue Credit	(9,934,000)	(10,368,150)	(10,702,763)	(11,009,236)	(11,460,070)	(12,105,871)	(10,620,831)	(11,113,070)	(11,621,182)	(12,597,031)	(13,175,326)
Prior Year Debt Service Coverage Credit	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(5,225,000)	(5,225,000)	(5,225,000)	(9,325,000)	(9,325,000)
Non-Signatory Terminal Fees	(618,115)	(637,008)	(667,136)	(701,688)	(726,858)	(1,309,316)	(1,366,238)	(1,438,796)	(2,019,780)	(2,126,514)	(2,244,249)
PFCs Applied to Debt Service	0	0	0	0	0	(17,300,000)	(13,950,000)	(13,400,000)	(26,900,000)	(21,300,000)	(20,300,000)
Net Signatory Requirement	\$6,922,885	\$7,117,092	\$7,438,889	\$7,814,524	\$8,087,947	\$14,566,580	\$15,202,075	\$16,021,448	\$22,520,551	\$23,747,525	\$25,013,988
Total Leased Space	149,000	149,000	149,000	149,000	149,000	154,787	154,787	154,787	156,000	156,000	156,000
Signatory Terminal Rental Rate	\$46.46	\$47.77	\$49.93	\$52.45	\$54.28	\$84.11	\$86.21	\$103.51	\$144.36	\$152.23	\$160.35
Signatory Terminal Rental Revenue	\$6,922,885	\$7,117,092	\$7,438,889	\$7,814,524	\$8,087,947	\$14,566,580	\$15,202,075	\$16,021,448	\$22,520,551	\$23,747,525	\$25,013,988
Non-Signatory Terminal Rental Revenue	618,115	637,008	667,136	701,688	726,858	1,309,316	1,366,238	1,438,796	2,019,780	2,126,514	2,244,249
Total Terminal Rental Revenue	\$7,541,000	\$7,754,100	\$8,106,025	\$8,516,213	\$8,814,805	\$15,875,896	\$16,568,313	\$17,460,244	\$24,540,331	\$25,874,039	\$27,258,237

Notes:

- 1/ Years 5 and 8 mark the incremental non-airline revenue impacts of the assumed terminal project alternative.
- 2/ Table corresponds to Exhibit 9-11 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-10 (a)

Landing Fee Rate (Cost Center Residual Example) and Cost Per Enplanement - Terminal Renewal Alternative

Fiscal Year Ending:	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Airfield Debt Service	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000
Airfield Debt Service Coverage (1.25X)	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Airfield Operating Expenses	10,875,000	11,320,000	11,784,350	12,268,625	12,773,225	13,299,875	13,849,150	14,422,525	15,020,400	15,644,000	16,295,050
Airfield Operating Expense Reserve	100,000	111,250	116,088	121,069	126,150	131,663	137,319	143,344	149,469	155,900	162,763
Total Airfield Requirement	\$11,975,000	\$12,431,250	\$12,900,438	\$13,389,694	\$13,899,375	\$14,431,538	\$14,986,469	\$15,565,869	\$16,169,869	\$16,799,900	\$17,457,813
Less:											
Airfield Non-Airline Revenue	(\$4,000,000)	(\$4,117,000)	(\$4,198,000)	(\$4,281,000)	(\$4,366,000)	(\$4,453,000)	(\$4,541,000)	(\$4,631,000)	(\$4,723,000)	(\$4,816,000)	(\$4,912,000)
Non-Signatory Airline Revenue	(637,295)	(666,019)	(698,490)	(732,154)	(767,182)	(803,559)	(841,364)	(880,804)	(921,690)	(966,840)	(1,013,701)
Prior Year Debt Service Coverage Credit	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)
Net Signatory Requirement	\$7,137,705	\$7,448,231	\$7,803,948	\$8,176,540	\$8,566,193	\$8,974,978	\$9,404,105	\$9,854,065	\$10,325,179	\$10,817,060	\$11,332,111
Signatory Landed Weight	3,920,000	3,998,000	4,078,000	4,160,000	4,243,000	4,328,000	4,415,000	4,503,000	4,593,000	4,685,000	4,779,000
Signatory Landing Fee	\$1.82	\$1.86	\$1.91	\$1.97	\$2.02	\$2.07	\$2.13	\$2.19	\$2.25	\$2.31	\$2.37
Non Signatory Landing Fee (1.25X)	\$2.28	\$2.33	\$2.39	\$2.46	\$2.52	\$2.59	\$2.66	\$2.74	\$2.81	\$2.89	\$2.96
Signatory Landing Fee Revenue	\$7,137,705	\$7,448,231	\$7,803,948	\$8,176,540	\$8,566,193	\$8,974,978	\$9,404,105	\$9,854,065	\$10,325,179	\$10,817,060	\$11,332,111
Non-Signatory Landing Fee Revenue	637,295	666,019	698,490	732,154	767,182	803,559	841,364	880,804	921,690	966,840	1,013,701
Total Landing Fee Revenue	\$7,775,000	\$8,114,250	\$8,502,438	\$8,908,694	\$9,333,375	\$9,778,538	\$10,245,469	\$10,734,869	\$11,246,869	\$11,783,900	\$12,345,813
CPE Calculation:											
Signatory Airline Revenue	\$14,060,590	\$14,565,323	\$15,224,162	\$15,968,537	\$16,705,017	\$21,034,367	\$22,176,031	\$23,329,689	\$28,131,431	\$29,666,466	\$31,222,272
Non-Signatory Airline Landing Fees	637,295	666,019	698,490	732,154	767,182	803,559	841,364	880,804	921,690	966,840	1,013,701
Non-Signatory Airline Terminal Rents	618,115	637,008	665,462	699,666	731,430	1,083,958	1,147,836	1,210,170	1,596,973	1,687,904	1,784,540
Total Airline Requirement	\$15,316,000	\$15,868,350	\$16,588,114	\$17,400,356	\$18,203,629	\$22,921,884	\$24,165,232	\$25,420,662	\$30,650,095	\$32,321,209	\$34,020,514
Total Projected Enplaned Passengers	3,000,000	3,068,000	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,665,000	3,748,000
Total Airline Cost per Enplaned Passenger	\$5.11	\$5.17	\$5.29	\$5.42	\$5.55	\$6.83	\$7.05	\$7.25	\$8.55	\$8.82	\$9.08
CPE in Current Year Dollars (3%)	\$5.11	\$5.02	\$4.98	\$4.96	\$4.93	\$5.90	\$5.90	\$5.90	\$6.75	\$6.76	\$6.75

Note:

1/ Table corresponds to Exhibit 9-12 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-10 (b)

Landing Fee Rate (Cost Center Residual Example) and Cost Per Enplanement - Terminal Replacement Alternative

Fiscal Year Ending:	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Airfield Debt Service	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000
Airfield Debt Service Coverage (1.25X)		200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Airfield Operating Expenses	10,875,000	11,320,000	11,784,350	12,268,625	12,773,225	13,299,875	13,849,150	14,422,525	15,020,400	15,644,000	16,295,050
Airfield Operating Expense Reserve	100,000	111,250	116,088	121,069	126,150	131,663	137,319	143,344	149,469	155,900	162,763
Total Airfield Requirement	\$11,975,000	\$12,431,250	\$12,900,438	\$13,389,694	\$13,899,375	\$14,431,538	\$14,986,469	\$15,565,869	\$16,169,869	\$16,799,900	\$17,457,813
Less:											
Airfield Non-Airline Revenue	(\$4,000,000)	(\$4,117,000)	(\$4,198,000)	(\$4,281,000)	(\$4,366,000)	(\$4,453,000)	(\$4,541,000)	(\$4,631,000)	(\$4,723,000)	(\$4,816,000)	(\$4,912,000)
Non-Signatory Airline Revenue	(637,295)	(666,019)	(698,490)	(732,154)	(767,182)	(803,559)	(841,364)	(880,804)	(921,690)	(966,840)	(1,013,701)
Prior Year Debt Service Coverage Credit	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)
Net Signatory Requirement	\$7,137,705	\$7,448,231	\$7,803,948	\$8,176,540	\$8,566,193	\$8,974,978	\$9,404,105	\$9,854,065	\$10,325,179	\$10,817,060	\$11,332,111
Signatory Landed Weight	3,920,000	3,998,000	4,078,000	4,160,000	4,243,000	4,328,000	4,415,000	4,503,000	4,593,000	4,685,000	4,779,000
Signatory Landing Fee	\$1.82	\$1.86	\$1.91	\$1.97	\$2.02	\$2.07	\$2.13	\$2.19	\$2.25	\$2.31	\$2.37
Non Signatory Landing Fee (1.25x)	\$2.28	\$2.33	\$2.39	\$2.46	\$2.52	\$2.59	\$2.66	\$2.74	\$2.81	\$2.89	\$2.96
Signatory Landing Fee Revenue	\$7,137,705	\$7,448,231	\$7,803,948	\$8,176,540	\$8,566,193	\$8,974,978	\$9,404,105	\$9,854,065	\$10,325,179	\$10,817,060	\$11,332,111
Non-Signatory Landing Fee Revenue	637,295	666,019	698,490	732,154	767,182	803,559	841,364	880,804	921,690	966,840	1,013,701
Total Landing Fee Revenue	\$7,775,000	\$8,114,250	\$8,502,438	\$8,908,694	\$9,333,375	\$9,778,538	\$10,245,469	\$10,734,869	\$11,246,869	\$11,783,900	\$12,345,813
CPE Calculation:											
Signatory Airline Revenue	\$14,060,590	\$14,565,323	\$15,242,836	\$15,991,064	\$16,654,140	\$23,541,558	\$24,606,180	\$25,875,513	\$32,845,729	\$34,564,585	\$36,346,099
Non-Signatory Airline Landing Fees	637,295	666,019	698,490	732,154	767,182	803,559	841,364	880,804	921,690	966,840	1,013,701
Non-Signatory Airline Terminal Rents	618,115	637,008	667,136	701,688	726,858	1,309,316	1,366,238	1,438,796	2,019,780	2,126,514	2,244,249
Total Airline Requirement	\$15,316,000	\$15,868,350	\$16,608,463	\$17,424,906	\$18,148,180	\$25,654,434	\$26,813,782	\$28,195,113	\$35,787,200	\$37,657,939	\$39,604,049
Total Projected Enplaned Passengers	3,000,000	3,068,000	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,665,000	3,748,000
Total Airline Cost per Enplaned Passenger	\$5.11	\$5.17	\$5.29	\$5.43	\$5.53	\$7.65	\$7.82	\$8.04	\$9.98	\$10.28	\$10.57
CPE in Current Year Dollars (3%)	\$5.11	\$5.02	\$4.99	\$4.97	\$4.92	\$6.60	\$6.55	\$6.54	\$7.88	\$7.87	\$7.86

Note:

1/ Table corresponds to Exhibit 9-12 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-11 (a)

Net Cash Flow and Debt Service Coverage - Terminal Renewal Alternative

Fiscal Year Ending:	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Signatory Terminal Rental Revenue	\$6,922,885	\$7,117,092	\$7,420,215	\$7,791,997	\$8,138,824	\$12,059,389	\$12,771,926	\$13,475,624	\$17,806,253	\$18,849,405	\$19,890,161
Non-Signatory Terminal Rental Revenue	618,115	637,008	665,462	699,666	731,430	1,083,958	1,147,836	1,210,170	1,596,973	1,687,904	1,784,540
Signatory Landing Fee Revenue	7,137,705	7,448,231	7,803,948	8,176,540	8,566,193	8,974,978	9,404,105	9,854,065	10,325,179	10,817,060	11,332,111
Non-Signatory Landing Fee Revenue	637,295	666,019	698,490	732,154	767,182	803,559	841,364	880,804	921,690	966,840	1,013,701
Non-Airline Operating Revenue	33,300,000	34,509,000	35,717,000	36,974,000	38,271,000	39,973,000	41,379,000	42,841,000	44,783,000	46,367,000	48,012,000
Non-Operating Revenue	1,309,000	1,347,650	1,296,636	1,184,419	1,122,871	1,181,266	1,276,643	1,339,313	1,673,380	1,692,391	2,340,736
Prior Year Debt Service Coverage	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	4,350,000	4,350,000	4,350,000	8,325,000	8,325,000
PFCs Applied to Debt Service						14,900,000	12,600,000	12,200,000	30,800,000	25,500,000	24,300,000
Total Revenue	\$50,925,000	\$52,725,000	\$54,601,750	\$56,558,775	\$58,597,500	\$79,976,150	\$83,770,875	\$86,150,975	\$112,256,475	\$114,205,600	\$116,998,250
Less:											
Operating Expenses	43,500,000	45,280,000	47,137,400	49,074,500	51,092,900	55,199,500	57,456,600	59,812,100	65,267,600	67,918,000	70,682,200
Net Revenue	\$7,425,000	\$7,445,000	\$7,464,350	\$7,484,275	\$7,504,600	\$24,776,650	\$26,314,275	\$26,338,875	\$46,988,875	\$46,287,600	\$46,316,050
Less Transfers To:											
Debt Service Fund											
Debt Service Coverage Fund	0	0	0	0	0	3,350,000	0	0	3,975,000	0	0
Prior Year Debt Service Coverage	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	4,350,000	4,350,000	4,350,000	8,325,000	8,325,000
O&M Expense Reserve Fund	425,000	445,000	464,350	484,275	504,600	1,028,650	564,275	588,875	1,363,875	662,600	691,050
Remaining Revenue for Airport Discretionary Fund	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000
Coverage Calculation:											
Net Revenue	\$7,425,000	\$7,445,000	\$7,464,350	\$7,484,275	\$7,504,600	\$24,776,650	\$26,314,275	\$26,338,875	\$46,988,875	\$46,287,600	\$46,316,050
Total Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$17,400,000	\$17,400,000	\$17,400,000	\$33,300,000	\$33,300,000	\$33,300,000
Debt Service Coverage	1.86	1.86	1.87	1.87	1.88	1.42	1.51	1.51	1.41	1.39	1.39

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-11 (b)

Net Cash Flow and Debt Service Coverage - Terminal Replacement Alternative

Fiscal Year Ending:	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Signatory Terminal Rental Revenue	\$6,922,885	\$7,117,092	\$7,438,889	\$7,814,524	\$8,087,947	\$14,566,580	\$15,202,075	\$16,021,448	\$22,520,551	\$23,747,525	\$25,013,988
Non-Signatory Terminal Rental Revenue	618,115	637,008	667,136	701,688	726,858	1,309,316	1,366,238	1,438,796	2,019,780	2,126,514	2,244,249
Signatory Landing Fee Revenue	7,137,705	7,448,231	7,803,948	8,176,540	8,566,193	8,974,978	9,404,105	9,854,065	10,325,179	10,817,060	11,332,111
Non-Signatory Landing Fee Revenue	637,295	666,019	698,490	732,154	767,182	803,559	841,364	880,804	921,690	966,840	1,013,701
Non-Airline Operating Revenue	33,300,000	34,509,000	35,717,000	36,974,000	38,271,000	40,272,000	41,687,000	43,186,000	45,535,000	47,155,000	48,825,000
Non-Operating Revenue	1,309,000	1,347,650	1,276,288	1,159,869	1,178,320	1,374,716	1,432,593	1,451,112	1,467,025	1,942,911	2,004,701
Prior Year Debt Service Coverage	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	5,725,000	5,725,000	5,725,000	9,825,000	9,825,000
PFCs Applied to Debt Service	0	0	0	0	0	17,300,000	13,950,000	13,400,000	26,900,000	21,300,000	20,300,000
Total Revenue	\$50,925,000	\$52,725,000	\$54,601,750	\$56,558,775	\$58,597,500	\$85,601,150	\$89,608,375	\$91,957,225	\$115,414,225	\$117,880,850	\$120,558,750
Less:											
Operating Expenses	43,500,000	45,280,000	47,137,400	49,074,500	51,092,900	54,199,500	56,426,600	58,751,100	61,581,600	64,121,000	66,771,200
Net Revenue	\$7,425,000	\$7,445,000	\$7,464,350	\$7,484,275	\$7,504,600	\$31,401,650	\$33,181,775	\$33,206,125	\$53,832,625	\$53,759,850	\$53,787,550
Less Transfers To:											
Debt Service Fund	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$22,900,000	\$22,900,000	\$22,900,000	\$39,300,000	\$39,300,000	\$39,300,000
Debt Service Coverage Fund	0	0	0	0	0	4,725,000	0	0	4,100,000	0	0
Prior Year Debt Service Coverage	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	5,725,000	5,725,000	5,725,000	9,825,000	9,825,000
O&M Expense Reserve Fund	425,000	445,000	464,350	484,275	504,600	776,650	556,775	581,125	707,625	634,850	662,550
Remaining Revenue for Airport Discretionary Fund	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000
Coverage Calculation:											
Net Revenue	\$7,425,000	\$7,445,000	\$7,464,350	\$7,484,275	\$7,504,600	\$31,401,650	\$33,181,775	\$33,206,125	\$53,832,625	\$53,759,850	\$53,787,550
Total Debt Service	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$22,900,000	\$22,900,000	\$22,900,000	\$39,300,000	\$39,300,000	\$39,300,000
Debt Service Coverage	1.86	1.86	1.87	1.87	1.88	1.37	1.45	1.45	1.37	1.37	1.37

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-12 (a)

Authority Flow of Funds - Terminal Renewal Alternative

Fiscal Year Ending:		Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue Fund											
Beginning Balance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Deposit: Total Revenue	49,925,000	53,601,750	55,558,775	57,597,500	78,976,150	79,420,875	81,800,975	103,931,475	105,880,600	108,673,250	
Expend: O&M Expenses	43,500,000	47,137,400	49,074,500	51,092,900	55,199,500	57,456,600	59,812,100	65,267,600	67,918,000	70,682,200	
Transfer: Debt Service Fund	4,000,000	4,000,000	4,000,000	4,000,000	17,400,000	17,400,000	17,400,000	33,300,000	33,300,000	33,300,000	
Transfer: Debt Service Coverage Fund	0	0	0	0	3,350,000	0	0	3,975,000	0	0	
Transfer: O&M Expense Reserve Fund	425,000	464,350	484,275	504,600	1,026,650	564,275	588,875	1,363,875	682,600	691,050	
Transfer: Discretionary Fund	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	4,000,000	4,000,000	25,000	4,000,000	4,000,000	
Ending Balance (Working Cap. Acct)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Debt Service Fund											
Beginning Balance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
DEPOSIT: Transfer From Revenue Fund	4,000,000	4,000,000	4,000,000	4,000,000	17,400,000	17,400,000	17,400,000	33,300,000	33,300,000	33,300,000	
EXPEND: Debt Service	4,000,000	4,000,000	4,000,000	4,000,000	17,400,000	17,400,000	17,400,000	33,300,000	33,300,000	33,300,000	
Ending Balance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Debt Service Coverage Fund											
Beginning Balance	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$4,350,000	\$4,350,000	\$4,350,000	\$8,325,000	\$8,325,000	
Deposit: Transfer From Revenue Fund	\$0	\$0	\$0	\$0	\$3,350,000	\$0	\$0	\$3,975,000	\$0	\$0	
Ending Balance	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$4,350,000	\$4,350,000	\$4,350,000	\$8,325,000	\$8,325,000	\$8,325,000	
Debt Service Reserve Fund											
Beginning Balance	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$17,400,000	\$17,400,000	\$17,400,000	\$33,300,000	\$33,300,000	\$62,600,000	
Transfer From Bond Issue	0	0	0	0	0	0	0	0	29,300,000	0	
Expend: Debt Service Reserve	0	0	0	0	0	0	0	0	0	0	
Ending Balance	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$17,400,000	\$17,400,000	\$17,400,000	\$33,300,000	\$62,600,000	\$62,600,000	
O&M Expense Reserve Fund											
Beginning Balance	\$10,450,000	\$11,320,000	\$11,784,350	\$12,268,625	\$12,773,225	\$13,799,875	\$14,364,150	\$14,953,025	\$16,316,900	\$16,979,500	
Deposit: Transfer From Revenue Fund	425,000	445,000	484,275	504,600	1,026,650	564,275	588,875	1,363,875	682,600	691,050	
Ending Balance	\$10,875,000	\$11,784,350	\$12,268,625	\$12,773,225	\$13,799,875	\$14,364,150	\$14,953,025	\$16,316,900	\$16,979,500	\$17,670,550	
Discretionary Fund											
Beginning Balance	\$50,000,000	\$51,507,500	\$42,436,588	\$38,874,908	\$27,890,090	\$28,282,300	\$30,851,478	\$31,065,983	\$28,677,653	\$29,132,310	
Deposit: Transfer From Revenue Fund	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	4,000,000	4,000,000	25,000	4,000,000	4,000,000	
Expend: Capital Expenditures	492,500	4,995,688	5,561,680	12,984,818	1,607,790	1,430,821	3,785,495	4,413,330	1,545,343	1,681,166	
Ending Balance	\$51,507,500	\$48,511,813	\$38,874,908	\$27,890,090	\$28,282,300	\$30,851,478	\$31,065,983	\$28,677,653	\$29,132,310	\$31,451,144	

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-12 (b)

Authority Flow of Funds - Terminal Replacement Alternative

Fiscal Year Ending:	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue Fund											
Beginning Balance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Deposit: Total Revenue	49,925,000	51,725,000	55,558,775	57,597,500	85,601,150	83,883,375	86,232,225	109,689,225	108,055,850	110,733,750	
Expend: O&M Expenses	43,500,000	45,280,000	49,074,500	51,092,900	54,199,500	56,426,600	58,751,100	61,581,600	64,121,000	66,771,200	
Transfer: Debt Service Fund	4,000,000	4,000,000	4,000,000	4,000,000	22,900,000	22,900,000	22,900,000	39,300,000	39,300,000	39,300,000	
Transfer: Debt Service Coverage Fund	0	0	0	0	4,725,000	0	0	4,100,000	0	0	
Transfer: O&M Expense Reserve Fund	425,000	445,000	484,275	504,600	776,650	556,775	581,125	707,625	634,850	662,550	
Transfer: Discretionary Fund	2,000,000	2,000,000	2,000,000	2,000,000	3,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	
Ending Balance (Working Cap. Acct)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Debt Service Fund											
Beginning Balance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
DEPOSIT: Transfer From Revenue Fund	4,000,000	4,000,000	4,000,000	4,000,000	22,900,000	22,900,000	22,900,000	39,300,000	39,300,000	39,300,000	
EXPEND: Debt Service	4,000,000	4,000,000	4,000,000	4,000,000	22,900,000	22,900,000	22,900,000	39,300,000	39,300,000	39,300,000	
Ending Balance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Debt Service Coverage Fund											
Beginning Balance	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$5,725,000	\$5,725,000	\$5,725,000	\$9,825,000	\$9,825,000	
Deposit: Transfer From Revenue Fund	\$0	\$0	\$0	\$0	\$4,725,000	\$0	\$0	\$4,100,000	\$0	\$0	
Ending Balance	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$5,725,000	\$5,725,000	\$5,725,000	\$9,825,000	\$9,825,000	\$9,825,000	
Debt Service Reserve Fund											
Beginning Balance	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$22,900,000	\$22,900,000	\$22,900,000	\$22,900,000	\$39,300,000	\$39,300,000	
Transfer From Bond Issue	0	0	0	0	0	0	0	35,300,000	0	0	
Expend: Debt Service Reserve	0	0	0	0	0	0	0	0	0	0	
Ending Balance	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$22,900,000	\$22,900,000	\$22,900,000	\$58,200,000	\$39,300,000	\$39,300,000	
O&M Expense Reserve Fund											
Beginning Balance	\$10,450,000	\$10,875,000	\$11,784,350	\$12,268,625	\$12,773,225	\$13,549,875	\$14,106,650	\$14,687,775	\$15,395,400	\$16,030,250	
Deposit: Transfer From Revenue Fund	425,000	445,000	484,275	504,600	776,650	556,775	581,125	707,625	634,850	662,550	
Ending Balance	\$10,875,000	\$11,320,000	\$12,268,625	\$12,773,225	\$13,549,875	\$14,106,650	\$14,687,775	\$15,395,400	\$16,030,250	\$16,692,800	
Discretionary Fund											
Beginning Balance	\$50,000,000	\$51,507,500	\$47,494,375	\$41,209,077	\$32,062,578	\$29,454,788	\$29,823,967	\$30,038,471	\$32,625,141	\$35,079,798	
Deposit: Transfer From Revenue Fund	2,000,000	2,000,000	2,000,000	2,000,000	3,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	
Expend: Capital Expenditures	492,500	6,013,125	8,285,298	11,584,818	5,607,790	3,630,821	3,785,495	1,413,330	1,545,343	1,681,166	
Ending Balance	\$51,507,500	\$47,494,375	\$41,209,077	\$41,647,397	\$32,062,578	\$29,454,788	\$30,038,471	\$32,625,141	\$35,079,798	\$37,398,633	

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc. September 2011.

Table B-13 (a)

Summary Financial Metrics - Terminal Renewal Alternative

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Projected Enplanements	3,000,000	3,068,000	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,665,000	3,748,000
Debt per enplaned passenger	\$12.98	\$12.15	\$11.32	\$64.79	\$61.86	\$58.94	\$116.31	\$111.14	\$105.97	\$100.85	\$95.71
Days cash on hand (Ending Balance)	441	399	336	297	206	203	224	216	185	201	205
CPE	\$5.11	\$5.17	\$5.29	\$5.42	\$5.55	\$6.83	\$7.05	\$7.25	\$8.55	\$8.82	\$9.08
CPE - Year 1 Current Dollars	\$5.11	\$5.02	\$4.98	\$4.96	\$4.93	\$5.90	\$5.90	\$5.90	\$6.75	\$6.76	\$6.75
Coverage ratio (x)	1.86	1.86	1.87	1.87	1.88	1.42	1.51	1.51	1.41	1.39	1.39
Direct Terminal Expenses/ Sq. Ft.	\$17.35	\$18.06	\$18.80	\$19.58	\$20.38	\$19.79	\$20.59	\$21.42	\$21.57	\$22.42	\$23.32
Revenue Per Enplanement:											
Food and Beverage/ EP	\$0.60	\$0.61	\$0.62	\$0.63	\$0.64	\$0.69	\$0.70	\$0.71	\$0.78	\$0.79	\$0.80
News and Gifts/ EP	\$0.57	\$0.57	\$0.58	\$0.59	\$0.60	\$0.66	\$0.66	\$0.67	\$0.74	\$0.75	\$0.76
Parking/ EP	\$5.33	\$5.41	\$5.49	\$5.57	\$5.65	\$5.73	\$5.82	\$5.90	\$5.99	\$6.08	\$6.17
Rental Car/ EP	\$2.67	\$2.71	\$2.74	\$2.78	\$2.83	\$2.87	\$2.91	\$2.95	\$2.99	\$3.04	\$3.08

Note:

1/ Table consistent with Table 9-4 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.
Prepared by: Ricondo & Associates, Inc., September 2011.

Table B-13 (b)**Summary Financial Metrics - Terminal Replacement Alternative**

	Current Year	Projected									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Projected Enplanements	3,000,000	3,068,000	3,137,000	3,208,000	3,280,000	3,354,000	3,429,000	3,506,000	3,585,000	3,665,000	3,748,000
Debt per enplaned passenger	\$12.98	\$12.69	\$12.42	\$90.07	\$86.90	\$83.74	\$143.91	\$138.44	\$133.00	\$127.62	\$122.23
Days cash on hand (Ending Balance)	441	391	327	317	236	218	230	222	236	256	258
CPE	\$5.11	\$5.17	\$5.29	\$5.43	\$5.53	\$7.65	\$7.82	\$8.04	\$9.98	\$10.28	\$10.57
CPE - Year 1 Current Dollars	\$5.11	\$5.02	\$4.99	\$4.97	\$4.92	\$6.60	\$6.55	\$6.54	\$7.88	\$7.87	\$7.86
Coverage ratio (x)	1.86	1.86	1.87	1.87	1.88	1.37	1.45	1.45	1.37	1.37	1.37
Direct Terminal Expenses/ Sq. Ft.	17.35	18.06	18.80	19.58	20.38	18.98	19.76	20.56	21.09	21.95	22.85
Revenue Per Enplanement:											
Food and Beverage/ EP	\$0.60	\$0.61	\$0.62	\$0.63	\$0.64	\$0.73	\$0.74	\$0.75	\$0.85	\$0.87	\$0.88
News and Gifts/ EP	\$0.57	\$0.57	\$0.58	\$0.59	\$0.60	\$0.69	\$0.70	\$0.71	\$0.81	\$0.82	\$0.83
Parking/ EP	\$5.33	\$5.41	\$5.49	\$5.57	\$5.65	\$5.73	\$5.82	\$5.90	\$5.99	\$6.08	\$6.17
Rental Car/ EP	\$2.67	\$2.71	\$2.74	\$2.78	\$2.83	\$2.87	\$2.91	\$2.95	\$2.99	\$3.04	\$3.08

Note:

1/ Table consistent with Table 9-5 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

Table B-14 (a)**Sensitivity Analysis Scenario Comparison - Terminal Renewal Alternative**

	Global Assumptions Year 8	Reduced Activity Scenario Year 8	Project Cost Increase Scenario Year 8
Projected Enplanements	3,585,000	3,316,000	3,585,000
Terminal Project Alternative Cost	\$409,486,751	\$409,486,751	\$450,435,427
Nominal CPE	\$8.55	\$10.44	\$9.64
Real CPE - Year 1 Current Dollars	\$6.75	\$8.25	\$7.61
Real CPE - Variance		\$1.50	\$0.86

Note:

1/ Table consistent with Table 9-6 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

Table B-14 (b)**Sensitivity Analysis Scenario Comparison - Terminal Replacement Alternative**

	Global Assumptions Year 8	Reduced Activity Scenario Year 8	Project Cost Increase Scenario Year 8
Projected Enplanements	3,585,000	3,316,000	3,585,000
Terminal Project Alternative Cost	\$492,078,419	\$492,078,419	\$541,286,261
Nominal CPE	\$9.98	\$12.34	\$11.14
Real CPE - Year 1 Current Dollars	\$7.88	\$9.74	\$8.80
Real CPE - Variance		\$1.86	\$0.92

Note:

1/ Table consistent with Table 9-7 within Chapter 9 of the Guidebook.

Source: Ricondo & Associates, Inc. September 2011.

Prepared by: Ricondo & Associates, Inc., September 2011.

Analysis Templates

The purpose of this appendix is to provide an explanation of some of the tables and charts included as part of the Airport Cooperative Research Program (ACRP) 07-07 Guidebook for Evaluating Terminal Renewal versus Replacement Options. Some of the analyses presented in the Guidebook require professional training and experience. Those analyses are not described in this appendix. It is recommended that the users of the Guidebook consult the appropriate manuals and reports, as required. The two options addressed by this template are Terminal Renew (Option 1) and Terminal Replace (Option 2). It is envisioned that the general framework outlined in this template can be applied to alternative analysis scenarios. The individual worksheets within the Microsoft Excel-based analysis template are described below.

Template	Table(s) within the Template
Facility Requirements	Table C-1
Facility Gap Analysis and Requirements Table	Table C-2
Program Cost Estimate	Table C-3
Performance Evaluation	Table C-4
Project Funding Availability Analysis—Input	Table C-5
Project Funding Availability Analysis—Output	Table C-6

C.1 Facility Requirements (Table C-1) and Gap Analysis Template (Table C-2)

The Facility Requirements and Gap Analysis Template is a tool to guide the determination of facility requirements and levels of service during the early stages of the project, typically through evaluation of planning options.

Results for the industry methods and procedures used to determine the requirements for each terminal function are to be recorded in appropriate sections of the template. Sections or individual elements of the airport's terminal not represented in the table should be added, as required.

Terminal facility requirements (Table C-1) can be calculated in a number of ways. Procedures and guidelines are available in:

- ACRP Report 25: *Airport Passenger Terminal Planning and Design*
- International Air Transport Association (IATA) *Airport Development Reference Manual* (9th Edition, April 2004)
- International Civil Aviation Organization (ICAO) *Airport Planning Manual*, Part 1

The methods and procedures in these manuals require the development of daily and peak hour passenger activity data and aircraft arrivals and departures counts for existing and any future years relevant to the evaluation of options.

Additional methods include ‘rules of thumb’ measures developed on the basis of typical relationships between passenger and aircraft activity. Passenger and aircraft activity can be considered on an annual basis (often expressed as million annual passenger, or MAP), daily basis (peak month average day, or PMAD) or on a peak hour basis (peak month average day peak hour, or PMADPH). For example, for some terminals, total enclosed square footage might range from 15,000 square feet to 25,000 square feet per aircraft gate; an airport terminal might justify one aircraft gate per 4 or 5 daily aircraft departures. Each airport and terminal is unique, so these measures are typically rough and best used to confirm the results of the more rigorous methods referenced above.

At the beginning of the planning process and during the development of options, the planning team should determine the space to be devoted to the various terminal functions and develop performance metrics for the existing terminal: number of daily or annual passengers per ticket counter, concession area, baggage makeup and claim areas, etc. These results should be compared to the perceived level of service provided by the various functional areas of the terminal, such as the length of queues at ticketing or security processing, or concession sales per passenger.

Gap analyses and requirements table (Table C-2) encompass all demand capacity calculations, facility requirements calculations, and performance and functionality shortfall analyses used to determine the short, medium, or long term need for facility alteration, improvement, or investment. Gap analyses include traditional planning activities for existing and future activity levels, such as:

- Demand / capacity calculations for terminal functional and spatial elements
- Facility requirements calculations based on standard industry measures or local needs
- Functionality assessments for passenger and baggage processing and service levels

Meanwhile, terminal design elements include the following:

- Building condition surveys for elements such as roofs, curtainwalls, windows, floors, etc.
- Life cycle status of major terminal systems and equipment
- Concession requirements, as measured by revenue per passenger goals
- Modernity issues related to community goals
- Building code compliance (grandfathered and current)
- Operation and maintenance (O&M) costs with respect to state of the art systems
- ‘Green’ initiatives with respect to building systems and utilities use

Many of these areas are (or should be) regularly investigated as part of:

- Preparation of airport Master Plans
- Annual O&M cost calculations
- Real time building systems monitoring and control systems
- Non-routine building events
- Benefit-cost analyses for capital plan development.

Separately, or in combination, these gap analyses are part of determining the need for major terminal changes and investment, including the decision to renew or replace facilities.

Template Steps and Notes (Table C-2)

1. Conform the list of terminal elements in the “Function” column to the functional elements in the existing terminal and to known missing elements desired in the future.
2. Determine amount of space allocated to each terminal function in the existing terminal. Include sizes of appropriate terminal systems, such as length of ticket counter or bag claim devices. Enter in “Existing Inventory” column.
3. Select a base planning year (typically the last year for which full year statistics are available, or the latest month of full statistics, annualized).

4. Determine desired planning activity levels for the terminal renew and replace options and calculate passenger and aircraft activity statistics for these planning levels. These planning activity levels are typically measured in terms of MAP or PMAD.
5. Using industry procedures and metrics as outlined above, calculate facility requirements for each desired planning activity level.
6. If the terminal renewal or replacement analysis will not result in an increase in the number of aircraft parking positions, it is often useful to calculate terminal requirements based on the passenger activity limits defined by the number of aircraft parking positions. To determine annual planning activity levels in this manner:
 - a. Multiply the number of aircraft parking positions \times 300,000 to 350,000 (if a “spoke” airport);
 - b. Multiply the number of aircraft parking positions \times 450,000 to 500,000 (if a hub airport or if a majority of flights are by a large low cost carrier);
 - c. Determine the number of PMAD passengers based on existing annual to PMAD passenger ratios at the airport.
7. Enter results in relevant spreadsheet cells, and identify where additional area and systems are required.
8. Summarize results for development of renew and replace options.

C.2 Program Cost Estimation Template (Table C-3)

Program costs can be developed in a number of ways, from benchmarking unit costs per square foot or per gate (high level planning estimates) to engineer’s estimates based on plan view drawings to cost estimator’s time and material takeoffs based on completed construction documents. In each type of estimate, it is important to include all related elements of the project from planning and architect and engineer fees to program management, phasing costs, and costs to relocate conflicting functions.

It is also important to include contingency estimates for the inevitable unknowns and uncertainties during project development and to match the contingency set-aside with the level of risk that the cost estimate might increase during design or construction. Early planning estimates can vary by as much as 20 percent or more from final costs because of project design changes or unknown site conditions, while final estimates with completed construction drawings might reasonably be estimated within 5 percent of final costs. These contingencies should be included in cost estimates as the project moves from planning to construction and completion.

Finally, cost estimates should be updated and recalculated several times during the course of the project. At a minimum, estimates should be updated at typical project milestones, such as alternative concept analysis, design completion, and construction document completion.

The Program Cost Estimation Template (Table C-3) is a tool to guide the estimation of program costs during the early stages of the project, typically through evaluation of planning options. It is primarily a unit cost based spreadsheet.

To complete the template, planning concept drawings need to be completed to a point where square footages for each major terminal function can be determined and the scale of major terminal systems and equipment (such as inbound and outbound baggage handling systems) can be estimated. Completion of the template also requires knowledge of typical per square foot costs for renovated and newly constructed spaces. These costs vary by

- Size of space being renewed or built new,
- Degree of desired finish,
- Degree of construction complexity,

- Geographical location, and
- Status of construction activity in the economy.

Costs associated with construction and terminal operations phasing also need to be considered. Terminal construction phasing costs include required spaces (renovated, temporary, or new) and the costs of relocating terminal operations. Operations phasing costs relate to the inefficiencies of ongoing terminal operations during construction (such as additional staff time) and are best determined through discussions with airport staff and tenants.

The template separates the terminal functional spaces into financial cost center categories to maintain a relationship with the financial analysis of costs described in Chapter 9 of the Guidebook.

Template Completion Steps and Notes (Table C-3)

1. Review the project and terminal elements in the left-hand column. Add elements from the current project that are not represented. Gather space and cost data related to these elements.
2. If phasing requires that holdrooms and aircraft parking positions be closed for construction, the cost to temporarily replace those positions must be included if no existing unused positions are available.
3. If the location for the temporary aircraft parking positions does not include adequate aircraft apron, costs to construct new apron must be included.
4. Utility hookups to temporary facilities and relocation expenses are also project costs. These costs can be incorporated into the unit costs for temporary facility construction.
5. The costs of constructing replacement facilities for airport functions within any expanded terminal footprint must be calculated as project costs. Demolition of existing adjacent and conflicting structures should be included.
6. "Terminal Rentable Space" includes airline operating areas (ticketing, holdrooms, operations offices, etc.) that are not leased directly to airlines and are typically charged on a per use basis.
7. Design and construction of airline leased space may have different requirements and costs than design and construction of airline common use space and should be reflected in square foot unit costs, to the extent such costs can be determined. However, airline leased and common use spaces can be assumed to have the same square footage costs during early stages of the planning and evaluation.
8. "Building and Operational Systems" typically require professionally prepared estimates.
9. Phasing costs can be roughly estimated as a percentage of construction costs with advice from program managers, airline staff, and airport staff.
10. Project contingency estimates should not be less than 10 percent to 20 percent of estimated construction cost in the early planning phases of a project. Contingency estimates should be distributed among defined construction phases.

C.3 Performance Evaluation Template (Table C-4)

The number of elements, functions, and characteristics of a terminal that must be considered when alternative concepts or options are being considered indicates that a process is needed to organize the evaluation. The process must take into account:

- The goals of the project; what it is intended to achieve,
- How well each option meets the terminal's functional requirements, and
- The relative importance of the goals and requirements.

Two significant elements in the evaluation are (1) determining a measurable method to rate the various terminal characteristics in a way that is applicable to all measures and (2) determin-

ing the appropriate balance of importance among the evaluation measures. Most qualitative measures can be rated in a good/better/best or poor/average/good range; for summary purposes, these ranges can be assigned values from 1 to 5, 1 to 10, or -2 to +2, etc. Typically, low and negative numbers represent poor results and high and positive numbers represent good results.

Quantitative measures should also incorporate consideration of relative ranges. For example, a range of required passenger walking distances might be rated 1 for longer walk distances and 5 for shorter walk distances.

Measures should be weighted for relative importance. It is easy to bias an evaluation by including more measures related to a particular terminal function than another (for example, including five measures related to the ticketing area but only two measures related to the security screening checkpoint). This effect can be minimized by weighting the measures before the evaluation. Such weighting should be performed by vote of staff and/or stakeholders.

The performance evaluation is only one of several analyses and tools used to select the preferred outcome. Others include the financial evaluations and the judgments of senior staff and community leaders.

Template Completion Steps and Notes (Table C-4)

1. From a list of project strategic goals, objectives, and facility requirements, select representative measures that characterize the project. This selection should be in conjunction with the facility gap and requirements analyses (discussed in Guidebook Chapters 7).
2. Select a performance rating method for each measure. The template uses 1 low to 5 high.
3. Select a relative weighting for each measure or category of measures. For example, all ticketing related measures could be counted as one category with one weighting. The mean relative weighting is equal to 1.5. A relative weighting greater than 1.5 signifies an increased importance for this facility relative to the average, and vice versa.
4. Assigned weights should reflect the answers to questions: Is this measure more important than another? Twice as important? Half as important? (Keep in mind that a measure with low performance results but high weighting can produce a higher score than a highly important measure with a low performance rating.)
5. Assign performance values to the measures.
6. Multiply performance values by weighting levels and record the results in the weighted matrix.
7. Total and analyze the results. Cross check the perceived validity of the results.

C.4 Project Funding Availability Template (Table C-5 and Table C-6)

The purpose of the Project Funding Availability Template is to allow the user to estimate the total funds available for a terminal renewal or replacement project based on operating, growth, project, and financing assumptions entered into the template. The template is designed to account for future available airline revenues, passenger facility charge (PFC) revenues, bond proceeds, and other available funding sources, such as Federal Aviation Administration (FAA) grants and state and local funds, to determine the total funding available during construction of the project and to pay debt service on bonds issued for the project. This template contains financially specific decision variables that require knowledge of the airport's financial position and the overall economic environment. The placeholder assumptions are related to the City Airport example detailed in the Guidebook and are solely to be used for comparison purposes.

C.4.1 Input Tab (Table C-5)

The Project Funding Availability Input tab allows the user to input all of the required assumptions and to see the resulting effects on funding availability. Each of the required assumptions, described below, will affect the estimated total funding availability for the project. The user may adjust certain assumptions while holding others constant to determine the effect of those assumptions.

Template Completion Steps and Notes (Table C-5)

Operating Assumptions

1. **Enplaned Passengers**—The number of enplaned passengers in the baseline (current) year of the analysis.
2. **Current CPE**—The total airline cost per enplaned passenger (CPE) at the airport in the baseline (current) year of the analysis.
3. **Non-airline Revenues**—The total amount of revenues received by the airport operator from other than airline sources in the baseline (current) year of the analysis.
4. **Investment Earnings**—All earnings gained on cash funds in the baseline (current) year of the analysis.
5. **Operating Expenses**—The total amount of operation and maintenance (O&M) expenses incurred by the airport operator in the baseline (current) year of the analysis.
6. **PFC Collection Rate**—The rate at which the airport operator collects a PFC, typically \$4.50. This collection rate was assumed to be constant throughout the analysis.
7. **Beginning PFC Balance**—The amount of uncommitted PFC revenues available to the airport enterprise at the time of the analysis.
8. **Beginning Cash Balance**—The amount of uncommitted cash available to the airport enterprise at the time of the analysis. Typically this is the beginning balance of the airport operator's discretionary fund. Annual cash expenditures may be entered in the "Additional Inputs" section.
9. **Entitlements**—If the airport received FAA Airport Improvement Program (AIP) entitlement grants and those entitlement grants are available to be applied to future projects, then the user enters "Yes;" otherwise, entitlement grants will not be incorporated in the analysis. In calculating entitlement grants in the analysis, the maximum entitlement using the FAA's enplanement-based calculation is assumed.

Growth Assumptions

A constant growth rate is assumed throughout the planning period.

10. **Enplaned Passenger Growth Rate**—The forecasted annual growth in enplaned passengers.
11. **Non-airline Revenue Growth**—In the analysis template, non-airline revenue growth is equal to enplaned passenger growth plus a fraction for inflation. The user enters the percentage of inflation affecting growth in the template. For example, if enplaned passenger growth is set at 2.25 percent, inflation is set at 3 percent and 50 percent of inflation is assumed to affect nonairline revenue growth; then, the calculated nonairline revenue growth is 3.75 percent (i.e., 2.25 percent + 1.5 percent).
12. **Operating Expense Growth**—Operating expense growth is a function of inflation in the template. O&M expenses are assumed to increase at the rate of inflation and the user enters an amount of assumed growth not connected with inflation. For example, if inflation is set at 3 percent and expenses are assumed to increase at 1 percent regardless of inflation, then the user enters "1 percent" and the calculated O&M expense growth is equal to "4 percent."
13. **Inflation**—The assumed rate of annual inflation; also affects growth in non-airline revenue and O&M expenses.

Project Assumptions

14. **Project Impact on Non-airline Revenues**—The user enters the net impact of the terminal project on terminal non-airline revenues for the year the project becomes fully operational. For example, a terminal project may yield a 10 percent increase in nonairline revenues resulting from additional concession opportunities; in this case, the user enters 10 percent. If a terminal project reduces nonairline revenues, then the user sets the project impact to a negative amount.
15. **Project Impact on Operating Expenses**—The user enters the net impact of the terminal project on terminal O&M expenses for the year the project becomes fully operational. For example, a terminal project may increase operating expenses 10 percent due to additional terminal square footage; in this case, the user enters 10 percent. If a terminal project reduces O&M expenses, then the user sets the project impact to a negative amount.
16. **Targeted Future CPE (non-escalated)**—The total airline cost per enplaned passenger targeted by the airport operator after the terminal project becomes fully operational. This amount should be entered in current year dollars.
17. **Years until Bonds Issued**—The number of years, from the current year, until the airport operator plans to issue bonds for the terminal project. The time period between the year bonds are issued and the year the terminal becomes fully operational determines the amount of capitalized interest in the financing assumptions.
18. **Years until Project Is Operational**—The number of years, from the current year, until the terminal project is fully operational. If the project has multiple phases, the user enters the year in which the last phase is expected to be complete.

Financing Assumptions

19. **Bond Interest Rate**—The assumed interest rate of the bonds issued for the terminal project (e.g., 6 percent).
20. **Capitalized Interest Rate**—The short term interest rate on debt service capitalized from the issuance of the bonds until the project is operational. Amortization and capitalized interest periods are determined based on the number of years until bonds are issued for the project and until the project is fully operational.
21. **Bond Coverage Ratio**—Assumed amount of coverage required on annual bond debt service (e.g., 1.25 times annual debt service).
22. **Rolling Coverage**—User must select “Yes” or “No” from the dropdown menu. “Yes” indicates that the bond coverage account will be funded by bond proceeds and will roll-over each year. “No” indicates that debt service coverage will be collected each year from airline revenues. Rolling coverage is recommended to maximize available funds for the project.

Additional Inputs

23. **Annual Factors**—Other factors that affect total project funding availability, but are not necessarily a fixed amount are included within the additional inputs section. The following items may be entered into the analysis on a year-by-year basis:
 - Existing debt service to be paid with airport revenues.
 - Estimated future debt service associated with other projects (e.g., the Capital Improvement Program [CIP]).
 - Existing debt service to be paid with PFC revenues.
 - Estimated PFC pay-as-you-go amounts for other projects.
 - Estimated cash expenditures to fund other capital projects (e.g., CIP).
 - Other available funding sources, such as: FAA discretionary grants, state and local grants, and local cash available to be spent on the terminal project.

C.4.2 Output (Table C-6)

The next tab of the template provides a table that presents the specified assumptions as well as the debt capacity, bond proceeds available for the project, and the total funds available for the project. Each calculation is provided in current year and escalated dollars, along with a graph comparing the two.

- **Debt Capacity**—Represents the total amount of debt the airport operator may issue for the project; this amount is equal to the par amount of the bonds. This amount includes the proceeds for construction, capitalized interest, costs of issuance, and funding the debt service reserve and coverage accounts.
- **Bond Proceeds Available for Future Project**—Represents the amount out of the total debt capacity that can be used to fund project expenditures.
- **Total Funds Available for Future Project**—Represents the full project funding capacity of the airport enterprise. This capacity includes the bond proceeds available for the project, plus excess airport revenues, excess PFC revenues available, and other available funding before and during construction of the project. The annual detail of these revenues is included in the “Capacity-Cash Flow” tab.

C.4.3 Template Backup Detail

Included in the template are two backup detail tabs showing the cash flow funding availability analysis and the bond proceeds calculation.

- **Cash Flow Funding Availability**—Presents projected total revenues less O&M expenses and debt service for each year, based on the assumptions entered on the Input tab, with a cumulative total of excess revenues available to fund the project. For the year in which the terminal becomes fully operational, the total annual excess revenues would then be used to pay debt service.
- **Calculation of Bond Proceeds**—The debt service amount calculated on the Cash Flow Funding Availability tab is then divided by an amortization factor based on the financing assumptions input into the template to determine debt capacity. Capitalized interest, bond issuance fees, debt service reserve funding, and debt service coverage account funding are subtracted to calculate the bond proceeds available for the project.

The cumulative total funds available for future projects in the year the project becomes fully operational is added to the calculated amount of bond proceeds to produce the total funds available.

Relevant ACRP Studies and Other Publications

D.1 Airport Development Planning and Financing

- 1) ACRP Project 11-03, Synthesis 01, *Innovative Finance and Alternative Sources of Revenue for Airports*, Transportation Research Board, Washington, D.C., 2007.

This synthesis study is intended to inform airport operators, stakeholders, and policy-makers about alternative financing options and revenue sources currently available or that could be available in the future in the United States. The report provides a brief overview of common capital funding sources used by airport operators, a review of capital financing mechanisms used by airports, descriptions of various revenue sources developed by airport operators, and a review of privatization options available to U.S. airport operators.

- 2) ACRP Project 11-03, Synthesis 13, *Effective Practices for Preparing Airport Improvement Program Benefit-Cost Analysis*, Transportation Research Board, Washington, D.C., 2009.

Airport Improvement Program (AIP) authorizing legislation requires that airports applying for funding of capacity-enhancing projects needing more than \$5 million in discretionary funds conduct a benefit-cost analysis (BCA). The objective of this synthesis is to describe successful assessment techniques that can be used by airports in performing BCAs for hard to quantify benefits from projects needing more than \$5 million in AIP discretionary funding.

- 3) ACRP Project 11-03, Synthesis 19, *Airport Revenue Diversification*, Transportation Research Board, Washington, D.C., 2010.

Airports are increasingly focused on diversifying their revenue streams in response to airline industry consolidation and emphasis on lowering costs. Synthesis 19 provides an overview of how the business model for airports has changed, and how alternative revenue development fits within the airport planning process and reviews various strategies that airports employ to leverage their resources.

- 4) ACRP Report 16, *Guidebook for Managing Small Airports*, Transportation Research Board, Washington, D.C., 2009.

ACRP Report 16 provides comprehensive advice on resources and techniques that can be applied to meet responsibilities that operators and managers of small airports have including: financial management, oversight of contracts and leases, safety and security, noise control, community relations, compliance with federal grant conditions, facility maintenance, and capital improvements.

- 5) ACRP Report 20, *Strategic Planning in the Airport Industry*, Transportation Research Board, Washington, D.C., 2009.

ACRP Report 20 is a guidebook for airport managers and policymakers using strategic planning to guide their decision-making process. The report links business concerns of managing an airport with other planning efforts, such as those conducted as part of a master planning process. The guidebook includes proven traditional techniques and tools that have

been effectively applied by some airport executives, as well as innovative practices that are emerging in the airport and other industries.

- 6) ACRP Report 26, *Guidebook for Conducting Airport User Surveys*, Transportation Research Board, Washington, D.C., 2009.

ACRP Report 26 explores the basic concepts of survey sampling and the steps involved in planning and implementing a survey. The guidebook also examines the different types of airport user surveys and includes guidance on how to design a survey and analyze its results.

- 7) ACRP Report 36, *Airport/Airline Agreements—Practices and Characteristics*. Transportation Research Board, Washington, D.C., 2010.

ACRP Report 36 provides a tool to assist both airport operators and airlines during business arrangement negotiations by describing the range of business relationships between airports and airlines (including the underlying rates and charges methodologies), presenting a general negotiation process and schedule, identifying key information for a negotiation, identifying the various issues that typically surface, describing the various alternatives for resolving potential conflicts and issues, and identifying the linkages among these various critical issues.

- 8) ACRP Report 42, *Sustainable Airport Construction Practices*, Transportation Research Board, Washington, D.C., 2011.

ACRP Report 42 explores a set of best practices, methods, procedures, and materials that if implemented during construction may have a sustainable and positive economic, operational, environmental, or social effect. The report includes the collection of sustainable airport construction practices in a searchable, filterable spreadsheet format on CRP-CD-88, which is packaged with the report.

- 9) ACRP Report 43, *Guidebook of Practices for Improving Environmental Performance at Small Airports*, Transportation Research Board, Washington, D.C., 2011.

ACRP Report 43 outlines federal environmental regulations and requirements and identifies activities in which airport operators can be proactive in promoting environmental stewardship. As a quick reference, summary graphics provide information pertaining to the cost and savings as well as the necessary knowledge and amount of time needed to implement a particular activity. In addition, there are five case studies that discuss environmental initiatives already undertaken at airports that can serve as a guide for other airports.

- 10) ACRP Report 49, *Collaborative Airport Capital Planning Handbook*, Transportation Research Board, Washington, D.C., 2011.

ACRP Report 49 provides guidance to those in the airport community who have responsibility for, and a stake in, developing, financing, managing, and overseeing an airport capital plan and the individual projects included in it. The handbook provides guidance on appropriate performers for each task in the collaborative planning process, and defines and describes the different ways to communicate to help ensure effective exchanges between internal and external stakeholders.

- 11) ACRP Project 11-03, Synthesis 21, *Airport Energy Efficiency and Cost Reduction*, Transportation Research Board, Washington, D.C., 2010.

ACRP Synthesis 21 explores energy efficiency improvements being implemented at airports across the country that are low cost and short payback.

- 12) ACRP Project 11-03, Synthesis 27, *Airport Self-Inspection Practices*, Transportation Research Board, Washington, D.C., 2011.

ACRP Synthesis 27 provides insight into common airport self-inspection practices. A comprehensive self-inspection program includes the components of training; inspecting; reporting discrepancies and findings; follow-up, resolution, and close-out; and quality control. The report may be useful to airports in benchmarking their self-inspection programs to peer airports and practices considered successful by regional U.S. Federal Aviation Administration personnel.

- 13) Airports Council International (ACI), *Policies and Recommended Practices Handbook 2009*, Airport Council International, Geneva, Switzerland, November 2009.

This handbook contains the current policies of the organization for use by the staff of ACI World and the regional offices and by ACI representatives at international meetings.

- 14) Federal Aviation Administration, *Airport Business Practices and Their Impact on Airline Competition*, United States Department of Transportation, Washington, D.C., October 1999.

This order provides guidance and procedures to be used by FAA personnel in the administration of the Passenger Facility Charge (PFC) Program. The guidance and procedures reflect established FAA practices that have successfully met the statutory and regulatory requirements of the PFC Program. The guidance and procedures are current as of the date of issuance of this order and incorporate all changes to the PFC Program introduced by the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR 21), as well as prior legislation.

- 15) Federal Aviation Administration, *Airport Capital Improvement Plan*, United States Department of Transportation, Washington, D.C., August 22, 2000.

This order prescribes the development of the national Airports Capital Improvement Plan (ACIP). The ACIP serves as the primary planning tool for systematically identifying, prioritizing, and assigning funds to critical airport development and associated capital needs for the national airspace system (NAS). The ACIP also serves as the basis for the distribution of grant funds under the AIP.

- 16) Federal Aviation Administration, *Airport Improvement Program Handbook*, United States Department of Transportation, Washington, D.C., June 28, 2005.

This order provides guidance and sets forth policy and procedures to be used in the administration of the AIP. Several FAA orders and advisory circulars are referred to in this directive. The references appear as the basic publication number without any suffix. However, the latest issuance of the publication should be used as the reference.

- 17) Federal Aviation Administration, *Land Acquisition and Relocation Assistance for Airport Projects*, United States Department of Transportation, Washington, D.C., August 1, 2005.

This order provides guidelines and identifies responsibilities for FAA acceptance and monitoring of airport-sponsor compliance with provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) (42 USC 4601 et seq.), as amended, on airport projects receiving federal financial assistance. This order incorporates all applicable requirements as provided in the Uniform Act implementing regulation 49 CFR Part 24, Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs (Federal Register 70, No. 590, January 4, 2005, and as may be amended).

- 18) Federal Aviation Administration, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects*, United States Department of Transportation, Washington, D.C., April 28, 2006.

This order provides information to FAA Office of Airports personnel and others interested in fulfilling NEPA requirements for airport actions under the FAA's authority. This order is part of FAA's effort to ensure its personnel have clear instructions to address potential environmental effects resulting from major airport actions. In preparing FAA Order

5050.4B, the Office of Airports has made it consistent with FAA Order 1050.1E.2. Information on federal environmental laws other than NEPA appears in another document titled *An Environmental Desk Reference for Airport Actions*. The Office of Airports will publish notices in the Federal Register announcing the Desk Reference's availability.

- 19) Federal Aviation Administration, *Passenger Facility Charge*, United States Department of Transportation, Washington, D.C., August 9, 2001.

This order provides guidance and procedures to be used by FAA personnel in the administration of the PFC Program. The guidance and procedures reflect established FAA practices that have successfully met the statutory and regulatory requirements of the PFC Program. The guidance and procedures are current as of the date of issuance of this order and incorporate all changes to the PFC Program introduced by the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR 21), as well as prior legislation.

- 20) Fitch Ratings, *Airports Rating Criteria Handbook for General Revenue, Passenger Facility Charge, and Letter of Intent Bonds*, New York, N.Y., March 12, 2007.

Fitch Ratings published methodology of how it reviews the economic, market, financial, and other factors in determining a rating for various types of airport related debt.

- 21) International Air Transport Association (IATA), *Airport Development Reference Manual*, Ninth edition, January 2004.

The Airport Development Reference Manual (ADRM) represents a consolidation of best industry practice with respect to the development of world-class airports through better design. Its content reflects the recommendations of IATA experts in all areas of airport planning, development, financing and operation, as well as input from world-renowned industry specialists and organizations keen to promote the development of world-class airport facilities.

- 22) Roper, Kathy O., "A White Paper on Strategic Facility Planning," International Facility Management Association, Houston, TX, 2009.

Strategic facility planning (SFP) is a process that can lead to better, more proactive delivery of services from a facility management organization to its stakeholders. The time taken to carry out SFP is well spent in that it helps to avoid mistakes, delays, disappointments, and customer dissatisfaction. It can actually allow facility plan implementations to run more quickly and smoothly. This white paper provides information on the SFP process, its requirements and benefits, and gives a facility manager the basic tools to launch and successfully complete SFP for the supported organization. Definitions are provided in an appendix to help clarify terms quickly or for reference. A process model is also provided to support visual thinkers and learners.

D.2 Terminal Building and Systems Design

- 1) Airports Council International, *Guidance Manual: Airport Greenhouse Gas Emissions Management*, ACI World Environment Standing Committee, 1st Edition, November 2009.

This document speaks to airports about the things they can do to manage and reduce emissions. There are arguments for changing infrastructure out and while there is a cost, there is also a cost savings such as the installation of LED lights and variable speed ventilation fans literally paying for themselves over time. There are the regulatory drivers that may vary from state to state although the US Environmental Protection Agency is requiring mandatory reporting for large GHG emissions sources, which airports would classify as. There is mention of a corporate responsibility airports may feel as being a good neighbor to the community.

- 2) Airports Council International, *Policies and Recommended Practices Handbook*, Seventh Edition, November 2009.

Section 6.2 titled Emissions and Local Air Quality addresses best practices airports could follow in order to lessen their impact on the environment. Subsection 6.2.10 addresses best practices to be considered for airport infrastructure, suggesting that stationary sources can emit a significant amount of pollutants. Section 6.3 discusses greenhouse gas emissions and climate change. In subsection 6.3.1, airport utility plants are mentioned as an infrastructure area for upgrades to lessen impact. The main focus of this chapter is actually determining emissions and pollutant types by measuring. Oftentimes, aircraft are considered the larger outpourer of pollutants but airport infrastructure needs to be recognized as well. Subsection 6.3.7 speaks to recommendation for new buildings to employ best practice energy efficiency and GHG technology, and that existing buildings be reviewed to ascertain areas of deficiencies. Section 6.4 speaks to the sustainability of the airports infrastructure.

- 3) ACRP Report 10, *Innovations for Airport Terminal Facilities*, Transportation Research Board, Washington, D.C., 2008.

ACRP Report 10 discusses the recent worldwide developments in landside facilities design and discusses future trends and innovative passenger service/processing concepts. Discussions focus on innovative approaches that improve the experience of passengers between the airport entrance and the secure portions of the passenger terminal, particularly as it relates to needs of an aging population. The innovations and concepts developed as part of this research effort were focused on those that could be implemented within the next 5 to 10 years at large- and medium-hub airports.

- 4) ACRP Research Results Digest 2, *Model for Improving Energy Use in U.S. Airport Facilities*, Transportation Research Board, Washington, D.C., 2007.

Research Results Digest 2 presents data on U.S. airports' utilization of 11 major energy management practices, offers a set of best practices for reducing energy use, and summarizes three case studies of recent recommissioning projects that resulted in significant reductions in energy use. Among the various comparative tables are potential energy indices for utility and energy costs on the basis of square foot, and in terms of enplanements.

- 5) ACRP Project 11-03, Synthesis 10, *Airport Sustainability Practices*, Transportation Research Board, Washington, D.C., 2008.

This synthesis study informs airport operators, stakeholders, and policy makers about a range of airport sustainability practices gathered from a literature review and web-based survey. It specifically targets airport operators and provides a snapshot of airport sustainability practices across the triple bottom line of environmental, economic, and social issues.

- 6) ACRP Project 11-03, Synthesis 21, *Airport Energy Efficiency and Cost Reduction*, Transportation Research Board, Washington, D.C., 2010.

Synthesis 21 documents energy efficiency improvements being implemented at airports across the country that are low cost and short payback by means of a survey, interviews, and a literature review. It targets terminal managers of small airports, staff, consultants, and other stakeholders interested in energy efficiency.

- 7) ACRP Project A11-03, Synthesis 20, *Airport Terminal Facility Activation Techniques*, Transportation Research Board, Washington, D.C., 2010.

This synthesis study is intended to inform airport terminal operators and those involved in the facility activation process about lessons learned during recent airport facilities openings so that effective airport terminal facility activation practices can be identified and shared across the industry. Information was largely gathered from individuals involved with one or more terminal activations at 14 domestic and international airports.

- 8) ACRP Report 25, *Airport Passenger Terminal Planning and Design, Volume I: Guidebook*, Transportation Research Board, Washington, D.C., 2010.

ACRP Report 25 provides guidance in planning and developing airport passenger terminals and assists users in analyzing common issues related to airport terminal planning and design. The guidebook addresses the airside, terminal building, and landside components of the terminal complex; describes the passenger terminal planning process and the important criteria and requirements needed to address emerging trends and create solutions for airport passenger terminals.

- 9) ACRP Report 30, *Reference Guide on Understanding Common Use at Airports*, Transportation Research Board, Washington, D.C., 2010.

Common Use is a facility allocation and management approach intended to maximize airport facility access and allocation through non-dedicated resources. ACRP 30 provides a guidebook for airport operators, airlines, and other entities interested in considering common use initiatives. The Reference Guide considers common use as more than simply technology and includes analysis and review of all areas and functions within an airport that might be affected by a non-dedicated shared-use facility. This Guide identifies common use issues and opportunities and provides guidance for decision-making efforts, recognizing that there are a multitude of common use approaches and variables.

- 10) ACRP Report 40, *Airport Curbside and Terminal Area Roadway Operations*, Transportation Research Board, Washington, D.C., 2010.

ACRP Report 40 includes guidance on a cohesive approach to analyzing traffic operations on airport curbside and terminal area roadways. The report examines operational performance measures for airport curbside and terminal area roadway operations and reviews methods of estimating those performance measures. The report includes a quick analysis tool for curbside operations and low-speed roadway weaving areas, highlights techniques for estimating traffic volumes, and presents common ways of addressing operational problems.

- 11) ACRP Report 52, *Wayfinding and Signing Guidelines for Airport Terminals and Landside*, Transportation Research Board, Washington, D.C., 2011

ACRP Report 52 is designed to provide airports with the tools necessary to help passengers find their way in and around the airport. The guidelines focus on four areas of the airport: (1) roadways—both on-airport, and off-airport access roads; (2) parking; (3) curbside and ground transportation; and (4) terminal. In addition, the guidelines discuss developing a wayfinding strategy; the use of technology and visual displays; and color, fonts, and sizes.

- 12) ACRP Project 11-03, Synthesis 8, *Common Use Facilities and Equipment at Airports*, Transportation Research Board, Washington, D.C., 2008

This synthesis explores common use technology that enables an airport operator to take space that has previously been exclusive to a single airline and make it available for use by multiple airlines and their passengers.

- 13) Clean Airport Partnership, *10 Airport Survey—Energy Use, Policies, and Programs for Terminal Buildings*, A Report to the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, May 16, 2003.

This survey of ten airports provides information on the policies and programs that these airports have developed to monitor and maximize energy efficiency; information allowing comparisons for energy use on a square-foot basis between the various airports and at buildings within the same airport. Interestingly, while surveys document that investments in building efficiency can yield significant rewards, it provides evidence that new terminal construction may not in many cases be more energy efficient than older facilities, largely due to the more dramatic nature of new terminal construction.

- 14) Federal Aviation Administration, *Airport Design, Advisory Circular 150/5300-13 (and Change 11)*, United States Department of Transportation, Washington, D.C., August 9, 2001.

This Advisory Circular presents guidance material for the planning and design of airport terminal buildings and related access facilities. It includes material and nomographs that provide general guidelines and approximations for determining space and terminal facility requirements for planning purposes. AC 150/5360-9, *Planning and Design of Airport Terminal Building Facilities at Nonhub Locations*, contains guidance material for use in planning terminal facilities at low-activity airports. It may be used in lieu of or in conjunction with AC 150/5300-13.

- 15) Federal Aviation Administration, *Airport Master Plans, AC 150/5070-6B*, United States Department of Transportation, Washington, D.C., August 9, 2001.

This Advisory Circular provides guidance for the preparation of Master Plans for airports that range in size and function from small, general aviation to large, commercial service facilities. The intent of this AC is to foster a flexible approach to master planning that directs attention and resources to critical issues.

- 16) Kampschroer, Kevin, *Federal Green Buildings Statement*, US General Services Administration (GSA), July 21, 2010.

The Office of Federal High Performance Green Buildings (OFHPGB) was created by Congress to enhance federal leadership in the field of large-scale sustainable real property portfolio management and operations. This statement provides an informational overview into the resources available from OFHPGB for green facility planning and justification. The statement includes not only cost savings for the building operation itself but also the reduction of carbon footprints, reduction in worldwide energy consumption, and providing a healthier interior workplace for employees.

- 17) Transportation Security Administration, *Recommended Security Guidelines for Airport Planning, Design and Construction*, Department of Homeland Security, Washington, D.C., June 15, 2006.

This document presents recommendations for incorporating sound security considerations into the planning, design, construction, and modification of security-related airport facilities and airport terminal buildings. It consolidates information developed through the participation of the Transportation Security Administration and other government and aviation industry professionals.

- 18) SITA, *Baggage Report 2010*.

Since 2005, SITA has produced an annual baggage report, which is designed to offer all air transport industry stakeholders the latest facts, figures, and trends related to global baggage processing and management.

- 19) U.S. Customs and Border Protection (CBP), *Airport Technical Design Standards for Passenger Processing Facilities*, Department of Homeland Security, Washington, D.C., August, 2006.

This publication is to serve as the primary reference document for Airport Authorities, architect/engineering consultants, airport owners/operators and all CBP personnel involved with the planning, design, renovation, and development of CBP passenger processing facilities at airports. It integrates federal inspection elements, establishes unified primary inspections, along with specialized secondary inspections.

D.3 Benefit-Cost Analyses

- 1) Abate, Douglas, Towers, Michael, Dotz, Richard, Romani, Luca, Luftkin, Peter, S., "The Whitestone Facilities Maintenance and Repair Cost Reference," Whitestone Research, published annually.

This publication is a comprehensive source of building maintenance & repair (M&R) cost statistics. It provides a collection of unique tools for answering simple but important questions.

The information is organized by both building type and by components like exterior enclosure, roofing, HVAC, etc. This publication can provide the M&R information that is required when performing the Life-Cycle Cost Analysis.

- 2) Bernhardt, Eric, Ballard, Spencer, Richardson, Nora. *“Capital Investment Decision-Making in a Slow Growth Environment,”* LeighFisher Consultants, November, 2009.

This article contains information on the methods and process of evaluation and justification of capital investments for airport terminal rehabilitation or replacement. It explains how the standard analyses have been primarily based on future demand compared to current capacity. Now, with the slower growth in demand, the evaluation should include cost benefit analyses of replacing older systems or entire facilities with ones that are more efficient and sustainable. This article can provide good insight into how the evaluation process has changed and what factors should have an impact on the decision to renovate or replace an existing terminal.

- 3) Dell’Isola, Alphonse, Kirk, Stephen, *Life-Cycle Costing for Facilities*, Reed Construction Data, 2003.

This book is both a tutorial manual that explains how to perform Life-Cycle Cost Analysis (LCCA), and a reference manual with data on many of the building systems and components. The tutorial chapters provide an easy to follow step-by-step explanation of the entire LCCA process including complex LCC analyses. The reference data includes information on annual maintenance, energy demand, and replacement life. Also included in this publication are LCCA Case Studies for various types of facilities and building systems, and forms that can be helpful in preparing the LCCA.

- 4) Federal Aviation Administration, *Benefit Cost Analysis on Airport Capacity Projects for FAA Decisions on Airport Improvement Program (AIP) Discretionary Grants and Letters of Intent (LOI)*, United States Department of Transportation, Washington, D.C., December 15, 1999.

The policy for AIP grants, issued on June 24, 1997, was that, for all capacity projects for which an airport sponsor seeks \$5 million or more in AIP discretionary funds, commencing in Fiscal Year 1998, a completed BCA must accompany the grant application. The policy for LOIs was that a BCA must be completed for any request for a LOI to be issued in Fiscal Year 1997 and thereafter. The BCA policy covers those projects that will upgrade airport facilities to meet higher design standards and that will allow new classes or aircraft to use the airport. The BCA policy is not applicable to those projects undertaken solely for the objective of safety, security, conformance with FAA standards, or environmental mitigation.

- 5) Fuller, Sieglinde, K., Petersen, Stephen, R., *Life-Cycle Costing Manual*, Federal Energy Management Program (FEMP), 1996.

This handbook is a guide to understanding how to perform an LCCA of investments in projects for federal buildings and facilities. This publication was originally aimed at supporting the FEMP LCC methods but has evolved into being one of the leading guides for conducting LCC analyses of buildings and building systems by both government agencies and the private sector. It is an excellent source for understanding the process and provides references to other publications and software. In addition to the manual, a supplement to Handbook 135, “Energy Price Indices and Discount Factors for LCC Analysis” is published annually by NIST to provide updated information.

- 6) Horvath, James, L., Strychaz, Stan, Haigh, Ian, Kimmel, Matt, *Commercial Square Foot Building Costs*, Saylor Publications, Inc., published annually.

This manual was designed to provide building cost data that can be used for preliminary planning and “ballpark” estimating. The manual is recognized as an industry standard by contractors, architects, lenders, planners, and appraisers. It is published annually and therefore costs are based on current construction costs. The manual includes 65 building types,

including an airport terminal, and contains additional cost information on the various portions of the building and systems that are typically associated with terminals. This publication can provide cost information for both major renovations and terminal replacements.

- 7) Rohm, Howard, “A *Balancing Act*,” Performance Magazine, Volume 2, Issue 2, The Balanced Scorecard Institute.

The Balanced Scorecard is a Performance Management system that can be used in any size organization to align vision and mission with customer requirements and day-to-day work, manage and evaluate business strategy, monitor operation efficiency improvements, build organization capacity, and communicate progress to all employees.

- 8) Transportation Security Administration, *Planning Guidelines and Design Standards for Checked Baggage Inspection Systems*, Department of Homeland Security, Washington, D.C., January 20, 2009.

This publication is fundamentally a planning guideline with TSA design standards for airport checked baggage inspection systems. It contains extensive information on the types of baggage handling systems along with cost and useful life expectancy of the equipment. Chapter 9 has the guidelines for calculating life-cycle costs for alternatives and includes average cost of the equipment. Chapter 5 contains information on the different types of systems and EDS machines. This publication can provide life-cycle expectancy and cost information for both major renovations and terminal replacements.

D.4 Building and Facility Management

- 1) APPA, Federal Facilities Council, Holder Construction, IFMA, NASFA, “*A Framework for Facilities Lifecycle Cost Management—Framework, Glossary & Definitions*.”

To help foster effective communication among public- and private-sector organizations with interests in infrastructure and real property, a charter, inter-association working group was formed. This report sets forth a guide for consistent use of appropriate terminology in order to enable effective communication among the various decision makers, building managers, operators, and technicians involved with facilities and physical infrastructure investment and management.

- 2) Berger, David, “*Ten Pitfalls to Avoid When Selecting a CMMS/EAM*,” Western Management Consultants, 2009.

This is a white paper to help guide facility managers in selecting software tools to help with Computerized Maintenance Management Systems/Enterprise Asset Management.

- 3) Motamedi, Ali and Hammad, Amin, “*Lifecycle Management of Facilities Components Using Radio Frequency Identification And Building Information Model*,” IT Con, Journal of Information Technology in Construction—ISSN 1874-4753, June 2009.

The article discusses Radio Frequency Identification (RFID) tags in an expanded and more integrated way for whole building life-cycle management. The Industry Foundation Classes (IFC) is standardizing interoperability as standard Building Information Modeling (BIM). Completion of the IFC model has now led to a collaboration between National Building Information Model Standard (NBIM) and the Construction Operations Building Information Exchange (COBIE) with a vision for “an improved planning, design, construction, operation, and maintenance process using a standardized machine-readable information model for each facility, new or old, which contains all appropriate information created or gathered about that facility in a format useable by all throughout its lifecycle.” The result is either existing or new facilities have life-cycle information recorded, tracked, and integrated for best business practice decisions on when a facility and/or components of the facility need to be rehabilitated or replaced.

- 4) The Whole Building Design Guide (WBDG), www.wbdg.org.

The WBDG, a program of the National Institute of Building Sciences, is a web-based portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria, and technology from a “whole buildings” perspective. Currently organized into three major categories—Design Guidance, Project Management, and Operations & Maintenance—at the heart of the WBDG are Resource Pages, reductive summaries on particular topics.

- 5) Williams, E., *Construction Operations Building Information Exchange (COBie)*, Whole Building Design Guide, October 4, 2010.

COBie is a component of the Building Management Modeling (BIM) process. This document provides an overview of what COBie produces from an asset/facility management approach during the early stages of a buildings development. It discusses assets broken down as not just generators and HVAC systems but includes floors and walls, the structure itself to be considered an asset to be tracked and managed. The explanation is carried through from design data gathering to construction data input. The author offers various solutions given the individuality of each project and the availability of integrated software programs.

- 6) Young, John, *Convergence Yields Smarter Facilities: Practical Applications for Building Planners and Operators*, Journal of Building Information Modeling, Fall 2010.

The author speaks about facility managers’ pressures to make their buildings “smarter.” Operating and maintaining buildings for longer periods of time requires retrofitting existing buildings or designing and constructing new buildings to be sustainable for optimal occupancy and use and why GIS operability with BIM can help support the facility manager goals. The article discusses proximity analysis and why it is important to planners and for green building analysis. The integration of BIM and GIS creates a smarter facility and by better managing assets produces an eventual positive return on investment.

D.5 Building and Facility Management Software/Tools

- 1) AssetWorks, “AssetMAXX,” <http://www.assetworks.com>.

AssetMAXX is a web-based solution to asset management, allowing users to securely maintain, collect, and retrieve data. It is reported to be the most comprehensive and flexible asset management tool available in the capital asset and real property tracking industry. This system appears to be more for tracking property assets and insurance. It supports maintenance repairs and history tacking. No printable brochure was available, but demos are available on line. This does not seem to be specifically applicable to airports. Many other facilities are mentioned but they do not parallel airport facility management.

- 2) Cityworks, “Cityworks,” <http://www.cityworks.com>.

Cityworks provides a comprehensive set of solution software for asset and work management along with add-on products that extend the user’s capabilities to conduct day-to-day business. This software appears to offer solutions that are GIS based for handling asset-management, permitting and licensing for city management. This does not appear compatible with airport management.

- 3) IBM, “Maximo v7.1,” <http://www-01.ibm.com/software/tivoli/products/maximo-asset-mgmt>.

This software provides asset lifecycle and maintenance management for all asset types on a single platform. It is used to help maximize the value of critical business and IT assets over their lifecycles by enforcing best practices that yield benefits for all types of assets, including transportation, production, delivery, facilities, communications and IT. Maximo is one of the most common systems in use at airports for computerized maintenance management. It is a tried and tested software solution. It can also be very costly. If an airport wants the Asset

Management feature they must first invest in the Maximo v7.1. If the investment is made this is a vast tool for airport management, including tracking, trending, resource management, maintenance, lifecycle costs, KPIs and reports. It is a very high-level solution but will be a large investment just for base licensing.

- 4) Infor EAM, “*Enterprise Asset Management*,” <http://www.datastream.net>.

Infor provides business-specific software to enterprising organizations, such as airports. With experience built-in, solutions assist organizations of all sizes in being more enterprising and adapting to rapid changes in the marketplace. The Enterprise Asset Management system offers solutions for maintenance, including scheduling preventive maintenance and assigning resources where they’ll do the most good. It organizes where and why capital assets might fail, and plans for alternatives. It offers the ability to predict equipment problems so they can be prevented from happening. The system helps with inventory/warranty by reducing inventory and purchasing costs, and collects on warranty-related claims. There is no printable brochure but demos and other information are available at the website. Most of the elements of this software seem geared toward manufacturing agencies and not airport facilities.

- 5) JD Edwards “*EnterpriseOne*,” <http://www.oracle.com/us/products/applications/jd-edwards-enterpriseone/asset-lifecycle-management/index.html>.

This is an Oracle licensed technology solution. EnterpriseOne offers a suite of products including asset management, and life-cycle cost. The suites interact into each business sector of the organization’s environment from finance and human resources to computerized maintenance management systems and day-to-day operations. Airports have used this system and with adequate training may utilize all that this robust system can offer. It is an expensive license to invest in but ties nearly all business sectors into one system.

- 6) VFA Inc. “*VFA.facility*,” <http://www.vfa.com/products-services/software-solutions/vfa-facility/vfa-facility-key-features>.

This software has assisted organizations in managing information regarding facility assets and leveraging that information to create capital projects, plans, and budgets. The key features include centralized information about facility assets, supporting the collection and management of a wide range of asset information, such as location, structure, type, uses, conditions, requirements and their associated costs, and related projects and plans.

This software offers a number of useful tools and does seem to be compatible for an airport environment and is also compatible with MAXIMO CMMS.

- 7) WebTMA, “Maintenance Management Software Solutions,” http://tmasystems.com/tma_products.asp.

This is a scalable, web-based solution that uses Microsoft .NET technology. It allows users to access the software via any standard web browser. Base module offers the functionality to manage work orders and preventive maintenance. Software also features project management, time manager, materials management, and contractor management modules. This company offers both desktop and web-based solutions. They appear to have clients in the aviation industry. The software seems to be a robust CMMS system with many tools for asset management.

Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI-NA	Airports Council International-North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation



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